Bottom Trawl Survey of Young-of-the-Year Lingcod (*Ophiodon elongatus*) in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006

A.M. Surry, J.R. King, and D.R. Haggarty

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
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BOTTOM TRAWL SURVEY OF YOUNG-OF-THE-YEAR LINGCOD (*Ophiodon elongatus*) IN THE STRAIT OF GEORGIA, *CCGS NEOCALIGUS*, JULY 28 – AUGUST 9, 2006

By

A.M. Surry, J.R. King, and D.R. Haggarty

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
V9T 6N7

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ABSTRACT

Surry, A.M., King, J.R., and Haggarty, D.R. 2007. Bottom trawl survey of young-of-the-year lingcod (*Ophiodon elongatus*) in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. Can. Tech. Rep. Fish. Aquat. Sci. 2740: x + 50 p.

The 2006 bottom trawl survey for young-of-the-year lingcod (*Ophiodon elongatus*) in the Strait of Georgia by the *CCGS Neocaligus* measured young-of-the-year lingcod density (number of fish per area swept) from late July to early August at index sites throughout the Strait of Georgia in Statistical Areas 13, 14, 16, 17, 18, 19, and 29. A total of 1062 young-of-the-year lingcod were caught at index sites along the western side of the Strait of Georgia in four depth strata ranging from 15 – 75 m, in the northern, southern, and southwestern regions. No lingcod were found on the eastern side of the Strait of Georgia. There were no significant differences in density estimates among depth strata, and generally there were no significant differences among sites within each region. Median density estimates of young-of-the-year lingcod were 1793 / km^2 in the northern region, 339 / km^2 in the southern region, and 1368 / km^2 in the southwestern region. Density was significantly higher in the northern region than in the southern region. Density estimates for northern, southern, and southwestern regions were significantly higher than those obtained at the same index sites in 2005. Young-of-the-year lingcod lengths and weights ranged from 99 –206 mm and from 4 – 62 g. Stomach contents of lingcod were predominantly fishes, with prey species including Pacific herring (*Clupea harengus*) and Pacific sandlance (*Ammodytes hexapterus*).

RÉSUMÉ

Surry, A.M., King, J.R., and Haggarty, D.R. 2007. Bottom trawl survey of young-of-the-year lingcod (*Ophiodon elongatus*) in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. Can. Tech. Rep. Fish. Aquat. Sci. 2740: x + 50 p.

Le relevé au chalut de fond de 2006 des morues-lingues (*Ophiodon elongatus*) de l'année mené par le *NGCC Neocaligus* dans le détroit de Georgia a permis de mesurer la densité des morues-lingues de l'année (nombre de poissons par superficie balayée) de la fin de juillet au début d'août dans des sites de référence se trouvant dans les zones statistiques 13, 14, 16, 17, 18, 19 et 29. Un total de 1 062 morues-lingues de l'année ont été capturées dans des sites de référence le long du côté ouest du détroit de Georgia, dans quatre strates de profondeur allant de 15 à 75 m, dans les régions nord, sud et sud-ouest. Aucune morue-lingue n'a été trouvée du côté est du détroit. Selon nos estimations, il n'y avait aucune différence significative de densité entre les strates de profondeur et, généralement, il n'y avait pas de différences significatives entre les sites au sein de chaque région. Les estimations de la densité médiane des morues-lingues de l'année étaient de 1 793/km^2 dans la région nord, de 339/km^2 dans la région sud et de 1 368/km^2 dans la région sud-ouest. La densité était significativement plus élevée dans la région nord que dans la région sud. Les estimations de densité dans les régions nord, sud et sud-ouest étaient significativement plus élevées que celles obtenues dans les mêmes sites de référence en 2005. La longueur et le poids des morues-lingues de l'année variaient respectivement de 99 à 206 mm et de 4 à 62 g. Le contenu stomacal des morues-lingues était constitué principalement de poissons-proies, notamment le hareng du Pacifique (*Clupea harengus*) et le lançon gourdeau (*Ammodytes hexapterus*).

INTRODUCTION

In 2003, a bottom trawl survey of young of the year lingcod was conducted as one component of a monitoring and assessment program for Strait of Georgia lingcod (King *et al.* 2003; Haggarty *et al.* 2004). The purpose of the 2003 survey was to establish an index of relative abundance of young-of-the-year lingcod in the Strait of Georgia. This survey produced density estimates (using number of fish caught per area swept) for index sites which could be compared to density estimates from the same sites from a similar survey which was conducted at approximately the same time of year in 1991 (Workman *et al.* 1992), and also established new sites that could be compared with future estimates. Subsequent surveys in 2004 (Haggarty *et al.* 2005) and 2005 (Surry *et al.* 2005) continued to assess young-of-the-year density at the same index sites, and further expanded the study area. The present survey constitutes a fourth replicate of the 2003 survey, and continues to provide density estimates at the index sites. This report describes the methodology and data collected during the 2006 survey, and compares density estimates obtained in 2006 to those from previous surveys.

Lingcod inhabit nearshore waters and are commonly found along the bottom at depths ranging from 3 to 400 m, with most found in rocky areas from 10 to 100 m. Typically, larger lingcod inhabit deep banks and reefs, while smaller lingcod inhabit shallow waters and banks (Forrester and Smith 1974). Post-larval lingcod in their first year of life are commonly called age-0, or young-of-the-year lingcod. Lingcod spawn in December to March, with peak spawning activity in late January to early February (Wilby 1937, Low and Beamish 1978). The larvae hatch in early March through late April, and for the first few weeks are planktonic (Phillips and Barraclough 1977), but migrate to deeper waters at night (Cass et al. 1990). Post-larval lingcod settle to the bottom in late May to early June and inhabit areas close to shore on the edge of kelp or eelgrass beds (Phillips and Barraclough 1977). The young-of-the-year lingcod gradually move to deeper flat bottom habitats, and by September, the young-of-the-year are found in a wide range of flat bottom areas (Cass et al. 1990).

A pilot study in 1990 established that the most effective means of catching young-of-the-year lingcod was bottom trawling on flat bottom at 15 - 35 m depth (Workman et al. 1992). The initial survey in 1991 took place from mid-July to early August and was timed to coincide with young-of-the-year lingcod becoming available to trawl gear, that is, large enough to be retained by the mesh, and located in habitat accessible to the gear (Workman et al. 1992). Subsequent surveys have attempted to cover similar time periods to ensure comparability of results. All surveys have focused on shallow areas (<35 m deep) with various combinations of mud, sand, and gravel substrates, with little or no slope. Due to the highly variable catches over purely muddy bottoms in the 1991 survey (King *et al.* 2003; Workman *et al.* 1992), most pure mud sites were excluded in subsequent surveys.

Index sites were classified into four regions that we have defined in the Strait of Georgia: northern, southern, eastern, and southwestern (Figure 1). Sites along the east coast of Vancouver Island (the western side of the Strait of Georgia) belong to the northern or southern regions, with the border between northern and southern defined as the division line between Statistical Areas 14 and 17 (Haggarty *et al.* 2004). This is consistent with oceanographic patterns in the Strait and is the usual division between the northern and central regions (Thomson

1981). Sites along the eastern coast of the Strait of Georgia that were added in 2004 (Haggarty *et al.* 2005) and 2005 (Surry *et al.* 2005) belong to the eastern region. While the eastern and western sides of the Strait of Georgia are not oceanographically distinct, the coast lines of the eastern and western sides are quite different, the east characterized by long, steep-sided fjords and a complex of islands, sounds, and passages, and the west with few inlets and a more regular coast line (Thomson 1981). Suitable habitat for young-of-the-year lingcod that corresponds with trawlable bottom in the east is quite scarce (Haggarty *et al.* 2005). In 2005 (Surry *et al.* 2005) sites south and west of the previous southern boundary of the survey area were added, extending into the mouth of Juan de Fuca Strait. The area west of Victoria was called the southwestern region.

METHODS

VESSEL AND NETS

The vessel used for the survey was the CCGS *Neocaligus*, an 18.8 m stern trawler with a net tonnage of 48.3 t. This vessel was also used for the 2003 – 2005 2003-2005 surveys (Haggarty *et al.* 2005; Haggarty *et al.* 2004; Surry *et al.* 2005), and replaced the R/V *Caligus*, which was used for the 1991 survey (Workman *et al.* 1992). As in the previous surveys, bottom trawl tows were made with a Marinovich flat trawl with a 13 m (43 ft) foot rope, a 12.5 m (41 ft) headrope, and a 1 cm mesh codend liner (Appendix Figure 1). This net was constructed with polypropylene mesh and is the same net that was used in the 2004 and 2005 surveys, a replacement for the original nylon net used in 2003 and 1991. The 13 m footrope used in this survey has 6.4 cm (2.5") rubber disks with a 10 cm section of 10 cm (4") rubber disks at each end. This is the same footrope as was used during the 2003 – 2005 surveys, and was made to the same specifications as the one used for the 1991 survey. The net was rigged with seven 20 cm plastic floats on the headrope. Tevron steel doors (1.5 m x 1.5 m, 350 kg) provided an estimated 13 m horizontal opening. A Seabird Electronics SBE39 temperature and depth sensor was attached to the net mesh near the headrope and deployed with each tow.

Fishing methodology was the same as that used in previous surveys (Haggarty *et al.* 2005; Haggarty *et al.* 2004; Surry *et al.* 2005; Workman *et al.* 1992). The target tow duration was 10 minutes with a vessel speed of approximately 2 knots. The start of each tow was defined as the moment that the trawl doors touched the bottom, while the end of each tow was the moment that the retrieval process began. Start and end positions, times, and depths were recorded for each tow. Weather conditions (Appendix Table 1) and tide height were recorded. Reflectance readings from the depth sounder, and additional characteristics of the site, such as plentiful kelp, sponge, or other invertebrates were also noted.

FISHING DEPTHS AND SITE LOCATIONS

This survey took place at index sites throughout the Strait of Georgia in Statistical Areas 13, 14, 16, 17, 18, 19, and 29 (Table 1; Figure 1). All sites were established in previous surveys (Haggarty *et al.* 2005; Haggarty *et al.* 2004; Surry *et al.* 2005; Workman et al. 1992).

Where possible sites sampled in previous years were revisited (Table 1). Sites have been classified by substrate types, determined from a combination of nautical charts and

reflectance readings from the depth sounder (Haggarty *et al.* 2005; Haggarty *et al.* 2004; Surry *et al.* 2005; Workman *et al.* 1992). Substrate types are described in terms of sand (S), mud (M), and rock (R), or combinations thereof. As in the 2003 – 2005 surveys, most pure mud sites established in 1991 were rejected because catches were highly variable (King *et al.* 2003; Workman *et al.* 1992). Other areas were not accessible to trawling due to the presence of abundant sport and commercial crab gear, because of high traffic in the area, or because the greater draught of the vessel used in 2003 – 2006 compared to that used in 1991 prevented some of the shallower sites from being accessed.

There is limited trawlable ground with suitable habitat for young-of-the-year lingcod in the southern, eastern, and southwestern regions of the Strait of Georgia. In these areas, tows were made wherever possible at each site. Tow locations were selected by examining nautical charts for areas with appropriate depth, slope, and substrate. Along the northwestern shore, between Qualicum and Comox, there is ample suitable and trawlable habitat. In this area, tow locations were randomized at each index site. For each index site between Qualicum and Campbell River, suitable habitat was identified by examining nautical charts for areas with appropriate depth, slope, and substrate. A polygon of suitable habitat for each site was hand drawn in ESRI ® Arcview™ 3.2, and random points were selected from within each polygon using Random Point Generator 1.3 (Jenness 2005). Random points were used as the tow start location unless the location was deemed by the vessel captain to be unsuitable for towing. In those cases, that point was omitted and the next random point was used.

Two depth strata (DS) were trawled at most sites: DS1 = 15 – 25 m; DS2 = 26 – 35 m. Two tows were attempted in each depth stratum at each site; however, this was not always possible due to limited habitat, trawlable bottom, or obstructions such as abundant crab gear. At some sites, suitable, trawlable habitat was only available at greater depths, and tows were fished in whatever depths were possible. At Qualicum Beach and Cape Lazo, where suitable, trawlable habitat was abundant, additional depth strata were fished, in order to more fully assess the depth distribution of young-of-the-year lingcod. Additional depth strata ranged from DS3 to DS5 in 20 m intervals from 36 – 95 m (Table 2). The additional depth range surveyed in 2006 is the same as that surveyed in 2005 (Surry *et al.* 2005); however the original six 10 m intervals, DS3 – DS8, have been combined into three 20 m intervals, to increase the number of tows possible in each depth stratum. The original depth strata are noted for reference in Table 2.

SAMPLING OF TOWS

The codend was emptied into a 1.65 x 1.5 x 0.3 m sorting table on deck. Species composition was determined by sorting the total catch or a random subsample of the total catch into species or lowest taxonomic group possible. Each species or taxonomic group was weighed to the nearest 0.1 kg and where practical, all individuals were counted.

Small catches (less than about 50 kg, based on a visual estimate of total catch with the large individuals removed) were fully sorted; however, in order to save time, larger catches were subsampled prior to sorting. Because catches generally consisted of a small number of large individuals and a large number of small individuals, in order to obtain an accurate estimate of species composition the large individuals were removed prior to obtaining a random subsample of the catch. In addition, all lingcod, rockfish, and greenling were removed prior to

collecting the subsample in order to ensure that as many individuals of these species as possible were available for biological sampling.

The random subsample for species composition was collected from the remaining catch using a large shovel, with each scoop obtained from a random location within the sorting table. It was assumed that within the sorting table, the catch would tend to be size stratified, with the smaller individuals at the bottom, so every effort was made to avoid bias towards either the "top" or "bottom" of the table. The subsample filled up to four 0.5 x 0.35 x 0.3 m baskets, as four full baskets was the upper limit of what could be sorted efficiently in the available time. The number of baskets depended on the size of the catch, with larger catches yielding larger subsamples. Catch which remained after the subsample was collected was quickly transferred to baskets through the small doors in the sorting table, while scanning for any remaining lingcod, rockfish and greenling. The remaining catch was weighed and discarded. Species composition of subsampled tows was determined by applying the proportions of each species or taxonomic group in the subsample to the weight of the discarded catch, and then adding those species that were removed prior to subsampling.

Species for whom all individuals were always removed prior to any subsampling included spiny dogfish (*Squalus acanthias*), ratfish (*Hydrolagus colliei*) , starry flounder (*Platichthys stellatus*), large sea stars (Asteroidea), large dungeness crabs (*Cancer magister*), big skate (*Raja binoculata*), and longnose skate (*R. rhina*). These species were weighed and counted quickly, and released alive if possible. All lingcod, rockfish, and greenling were retained for biological sampling as outlined below. Where time permitted, samples of spiny dogfish (*Squalus acanthias*), Pacific cod (*Gadus macrocephalus*), rock sole (*Lepidopsetta bilineata*), English sole (*Parophrys vetulus*), and Pacific sanddab (*Citharichthys sordidus*) were retained in order to obtain length-frequency information for these commercially important species; an attempt was made to cover as many regions and depth strata as possible.

CALCULATION OF YOUNG-OF-THE-YEAR DENSITY

Start and finish positions were used to calculate the distance towed for each tow using the Spherical Law of Cosines (Veness 2002 – 2007):

$$d = \arccos(\sin(lat_{start}) * \sin(lat_{end}) + \cos(lat_{start}) * \cos(lat_{end}) * \cos(lon_{end} - lon_{start})) * R$$

where:

d	=	distance towed in metres
lat	=	latitude of start or end position in radians
lon	=	longitude of start or end position in radians
R	=	Earth's radius (mean radius = 6,371,000 metres)

The area swept by the trawl net was calculated by multiplying the distance towed by the estimated maximum horizontal net opening (13 m). The density of young-of-the-year lingcod was then calculated as number of fish per km^2 of swept area.

Density estimates were compared among sites, depth strata, regions, and years using the Mann-Whitney nonparametric test and the Kruskal-Wallace nonparametric analysis of

variance (Zar 1999). Nonparametric Tukey-type multiple comparisons were conducted where necessary (Zar 1999). The statistics software package S-PLUS version 6.0 for Windows (Insightful Corporation 1988 – 2001) was used to perform the Kruskal-Wallace tests and to compute p-values for the Normal approximation to the Mann-Whitney test.

BIOLOGICAL SAMPLING

Fork length (mm) and weight (g) were measured for all lingcod. Length and weight data were used to calculate Condition Factor using the following formula (Cailliet *et al.* 1986): Weight (g) * Length (mm)$^{-3}$. Stomachs were examined from up to 20 lingcod from each depth stratum at each site; if more than 20 lingcod were captured in a depth stratum, 20 fish were randomly selected. Prey items were removed from the stomachs and identified to the lowest taxonomic category possible, or assigned a general grouping such as "fish remains" or "invertebrate remains". For each prey item, a qualitative assessment was made of how much digestion had occurred, with prey items categorized as fresh, ¼ digested, ½ digested, ¾ digested, or fully digested (Appendix Table 2). The volume (cm^3) of each prey item was estimated using a ruler marked with 1 mm increments. Sagittal otoliths were collected from all lingcod for which stomachs were also examined. Otoliths will be utilized for daily growth ring analysis.

Fork length (mm) and weight (g) were measured, and sex was determined for copper rockfish (*Sebastes caurinus*), quillback rockfish (*S. maliger*), and greenstriped rockfish (*S. elongatus*). Sagittal otoliths were collected from copper and quillback rockfish for subsequent age determination.

All kelp greenling (*Hexagrammos decagrammus*) and a sample of whitespotted greenling (*H. stelleri*) representing the available size range were frozen for subsequent collection of aging structures.

Where time permitted and sufficient quantities of fish were captured, length frequency data were collected for a number of commercially important or abundant species. Total length (cm) was measured and sex was determined for spiny dogfish (*Squalus acanthias*). Fork length (cm) was measured for Pacific cod (*Gadus macrocephalus*), rock sole (*Lepidopsetta bilineata*), English sole (*Parophrys vetulus*), and Pacific sanddab (*Citharichthys sordidus*).

RESULTS

TOW INFORMATION

A total of 86 tows were made at 20 sites in the Strait of Georgia between July 28 and August 9, 2006 (Appendix Table 3). Five of the 86 tows were designated as unusable when the net had to be retrieved early due to snagging on rocky bottom. One tow was designated as unusable due to extremely unfavourable tide conditions. Usable tows ranged in duration from 5 – 11 minutes (median = 10 minutes). Eight sites were located in the northern region of the Strait of Georgia (the western side of Statistical Area 13 and all of Statistical Area 14). Seven sites were located in the southern region (Statistical Areas 17 and 18 and the northern portion of Statistical Area 19). Three sites were located in the eastern region (Statistical Areas 16 and 29, and the eastern side of Statistical area 13). Two sites were located in the southwestern region

(the southwestern portion of Statistical Area 19). For Statistical Areas, regions, and site locations, refer to Table 1 and Figure 1.

A Seabird Electronics SBE39 temperature and pressure probe was deployed with all tows. All data were collected with a 10 second sampling interval. Pressure data were used to verify and supplement the depth information recorded on the Bridge Log. Average temperature at the maximum gear depth during each tow is presented with the bridge log data in Appendix Table 3.

CATCH COMPOSITION

The mean catch weight per tow was 90 kg, with catches ranging from 19 – 442 kg for each usable tow (Appendix Table 4). The total catch for the survey was 7220 kg. One hundred twenty-four species or taxonomic groups of fishes and invertebrates were identified, of which 70 species were fishes and 54 were invertebrates. Total catch weight and numbers of individuals for each species and taxonomic group are presented in Table 3, along with the relative proportions of the total catch for the survey. Fishes accounted for 6764 kg or 94% of the total catch of the survey by weight. Spiny dogfish (*Squalus acanthias*), rock sole (*Lepidopsetta bilineata*), and English sole (*Parophrys vetulus*) were the most abundant species by weight, with catches of 2007 kg (28%), 1468 kg (20%), and 1341 kg (19%), respectively. Young-of-the-year lingcod accounted for 29 kg or 4% of the total catch by weight. Of the invertebrates, giant plumose anemone (*Metridium sp.*) and dungeness crab (*Cancer magister*) were the most abundant species by weight, accounting for 139 kg (2%) and 86 kg (1%) of the total catch. Total catch weight by species is summarized in Table 3, while catch composition for each tow is presented in Appendix Table 4.

LINGCOD CATCH AND DENSITY ESTIMATES (2006)

A total of 1062 young-of-the-year lingcod were captured in sixty-nine of 80 usable tows (Table 3). For tows that captured young-of-the-year lingcod, catches ranged from 1 – 105 lingcod per tow, while density ranged from 109 – 11302/km^2 per tow (Appendix Table 3). Lingcod were captured in depth strata (DS) 1 – 3 (DS1 = 15 – 25 m; DS2 = 26 – 35 m; DS3 = 36 – 55 m) in the northern, southern, and southwestern regions of the Strait of Georgia. No lingcod were captured in the eastern region. Lingcod were captured in DS4 (56 – 75 m) at the two northern index sites, Qualicum Beach and Cape Lazo, where this stratum was fished. The maximum capture depth of young-of-the-year lingcod was 75 m (DS 4) at Qualicum Beach. No lingcod were captured in DS 5 (76 – 85 m). Tow by tow catch and density data for young-of-the-year lingcod is presented with the bridge log data in Appendix Table 3.

Summary statistics for density by site and region are presented in Table 4. Density box plots are presented by site and region in Figure 2. There were no significant differences in density among depth strata ($p < 0.05$), and depth strata are therefore combined for each site (Table 4). Tows fished in DS5 at Qualicum Beach and Cape Lazo were not included in density summary statistics or any further analyses, as DS5 was determined to be beyond the maximum depth range of young-of-the-year lingcod.

Density of young-of-the-year lingcod was very variable both among and within sites and regions, ranging from 0 – 11302/km^2 (Table 4 and Figure 2). Coefficients of variation (CV) for each site ranged from 31 – 124 %. Generally, density was not significantly different among sites within each region ($p < 0.05$), although some difference was indicated for the southern region ($p = 0.03$) (Table 4). Subsequent testing showed that while the difference between the sites with the lowest and highest densities in the south, Pylades Channel (PY) and Walker Hook (WH), respectively, was significant, it was not possible to draw conclusions regarding differences among the other southern sites (Table 5). Subsequent analyses therefore proceeded as though there were no differences in density between sites within any of the regions. When sites were combined for each region, density in the northern region was significantly higher than in the southern region ($p = 0.0001$) (Table 6). The southwestern and eastern regions were not included in regional comparisons of density, due to the relatively small number of tows in these regions.

In the northern region, 42 tows captured 863 young-of-the-year lingcod in DS1 – DS4 (Table 4). Density ranged from 232 – 11302/km^2, with a median of 1793/km^2 and a mean of 2499/km^2 (CV = 96%). The highest density for the survey occurred at Black Creek in the northern region, where density over four tows at this site ranged from 2182 – 11302/km^2, with a median of 4249/km^2, and a mean of 5496/km^2 (CV = 78%).

In the southern region, 23 tows captured 129 young-of-the-year lingcod in DS1 – DS3 (Table 4). Density ranged from 0 – 3522/km2, with a median of 339/km2 and a mean of 750/km2 (CV = 127%). The lowest density for the survey at sites that captured lingcod occurred at Walker Hook in the southern region, where density over the four tows at this site ranged from 0 – 122/km^2, with a median of 57/km^2, and a mean of 59/km^2 (CV = 115%).

In the southwestern region, six tows captured 70 young-of-the-year lingcod in DS1 – DS3 (Table 4). Density ranged from 629 – 2771/km2, with a median of 1368/km2 and a mean of 1485/km2 (CV = 48%).

In the eastern region, six tows in DS2 and DS3 captured no lingcod (Table 4).

INTERANNUAL DENSITY COMPARISONS (1991; 2003 – 2006)

A detailed time series analysis is beyond the scope of this report. However, annual density estimates were examined graphically by region, both for the 1991; 2003 – 2006 series of index sites, and for the 2003 – 2006 series of sites, utilizing only those data collected from sites visited in each survey year of the series in DS1 – DS3 (Table 7 and Figure 3). Trends were similar for both the 1991; 2003 – 2006 series, and the 2003 – 2006 series. The highest densities for the northern region occurred during the 2003 survey, while the lowest densities occurred in 2005. The highest densities in the southern region occurred during the 1991 and 2006 survey years, while the lowest densities occurred in 2005.

Young-of-the-year density estimates from 2006 were compared to those obtained from the 2005 survey for the northern, southern, and southwestern regions, utilizing only those density estimates obtained at sites common to both years in depth strata 1 – 3 (Table 8). For all regions, young-of-the-year densities were higher in 2006 than in 2005 ($p<0.0025$).

LINGCOD BIOLOGICAL DATA

Lengths and weights were measured and condition factors determined for 1061 young-of-the-year lingcod (Figure 4). Summary statistics are provided by site and region in Table 9. The distributions of length, weight and condition factor were similar in the three regions, with modes occurring at 156 – 160 mm, 226 – 230 g, and $0.66 \times 10^{-5} - 0.70 \times 10^{-5}$ g/mm^3 in the northern and southern regions, and at 131 – 135 mm, 11 – 20 g, and $0.61 \times 10^{-5} - 0.65 \times 10^{-5}$ g/mm^3 in the southwestern region. In the northern region, length ranged from 99 – 198 mm, with a mean of 152 mm (CV = 10%), weight ranged from 4 – 56 g, with a mean of 24 g (CV = 32%), and condition factor ranged from $0.41 \times 10^{-5} - 0.89 \times 10^{-5}$ g/mm^3, with a mean of 0.66×10^{-5} g/mm^3 (CV = 11%). In the southern region, length ranged from 102 – 185 mm, with a mean of 155 mm (CV = 10%), weight ranged from 4 – 42 g with a mean of 25 g (CV = 28%), and condition factor ranged from $0.38 \times 10^{-5} - 0.87 \times 10^{-5}$ g/mm^3, with a mean of 0.65×10^{-5} g/mm^3 (CV = 9%). In the southwestern region, length ranged from 115 – 206 mm, with a mean of 150 mm (CV = 14%), weight ranged from 10 – 62 g, with a mean of 23 g (CV = 49%), and condition factor ranged from $0.51 \times 10^{-5} - 0.79 \times 10^{-5}$ g/mm^3, with a mean of 0.63×10^{-5} g/mm^3 (CV = 9%). The greatest mean length (165 mm) occurred at Pylades Channel (PY) in the southern region, while the greatest mean weight (31 g) occurred at Nanaimo (NN), also in the southern region. The largest mean condition factor (0.89×10^{-5} g/mm^3) occurred at Black Creek (BC) and Qualicum Beach (QU) in the northern region.

Stomachs were examined from 596 young-of-the-year lingcod (Table 10 and Table 11). Of these, 396 (66%) contained prey items identifiable to a general category or to species. Unidentifiable prey items were generally too digested to retain identifiable features. Most stomachs contained only one type of prey, but a small number contained two types. Most prey items were more than 50% digested, although all digestion stages were represented. Young-of-the-year lingcod consumed an average prey volume of 1.3 cm^3. Fish species were the most commonly encountered prey items, with the general category "fish remains" the most common, accounting for 51 % of occurrences, and Pacific herring accounting for 25% of occurrences.

OTHER SPECIES

Rockfishes

Rockfishes (*Sebastes sp.*) were present in 18 tows, with a maximum capture depth of 92 m (Appendix Table 3 and Table 3). Thirty-four copper rockfish (*S. caurinus*), 36 quillback rockfish (*S. maliger*), and 17 greenstriped rockfish (*S. elongatus*) were caught. Sagittal otoliths and length, sex, and weight data were collected for all copper and quillback rockfish, and length, sex, and weight data were collected for 15 greenstriped rockfish (Appendix Table 5). Copper rockfish lengths and weights ranged from 116 – 480 mm and 64 – 2020 g, respectively. Quillback rockfish lengths and weights ranged from 90 – 390 mm and 10 – 1040 g, respectively. Greenstripe rockfish lengths and weights ranged from 157 – 243 mm and 49 – 220 g, respectively.

Spiny Dogfish

Spiny dogfish (*Squalus acanthias*) were present in 73 tows, with a maximum capture depth of 92 m, and a total catch of 2007 kg (Appendix Table 3 and Table 3). Length and sex data were collected for 190 spiny dogfish (Appendix Table 6). Spiny dogfish in the southern region in depth stratum 3 ranged in length from 50 – 72 cm for males and from 53 – 76 cm for females. Spiny dogfish in the northern region in depth stratum 1 ranged in length from 62 – 99 cm for males, and from 68 – 97 cm for females.

Pacific Cod

Pacific cod (*Gadus macrocephalus*) were present in 51 tows, with a maximum capture depth of 92 m, and a total catch of 56 kg (Appendix Table 3 and Table 3). Length data were collected for 439 Pacific cod from depth stratum 2 (Appendix Table 7). Pacific cod in the northern region ranged in length from 11 – 18 cm, with a mode of 13 cm. Pacific cod in the southern region ranged in length from 11 – 15 cm, with a mode of 14 cm. Pacific cod in the southwestern region ranged in length from 8 – 15 cm, with a mode of 12 cm.

Flatfishes

English sole (*Parophrys vetulus*), rock sole (*Lepidopsetta bilineata*), or Pacific sanddab (*Citharichthys sordidus*) were present in all 80 usable tows, with a maximum capture depth of 92 m (Appendix Table 3 and Table 3). Total catches were 1341 kg for English sole, 1468 kg for rock sole, and 246 kg for Pacific sanddab. Six hundred ninety-nine English sole were measured (Appendix Table 8). English sole in the northern region in depth stratum 2 ranged in length from 10 – 42 cm, with a modal length of 19 cm. English sole in the southern region in depth stratum 1 ranged in length from 7 – 23 cm with a modal length of 15 cm, while in depth stratum 2 they ranged in length from 15 – 35 cm with a modal length of 17 cm. English sole in the southwestern region in depth stratum 2 ranged in length from 10 – 29 cm with a modal length of 16 cm. English sole in the eastern region in depth stratum 3 ranged in length from 13 – 26 cm with a modal length of 26 cm. Five hundred sixty-one rock sole were measured (Appendix Table 8). Rock sole in the northern region in depth stratum 2 ranged in length from 8 – 35 cm with a modal length of 22 cm. Rock sole in the southern region in depth stratum 2 ranged in length from 11 – 39 cm; sample size (n = 36) was too small to determine a modal length. Rock sole in the southwestern region ranged in length from 9 – 37 cm with a modal length of 20 cm. Rock sole in the eastern region ranged in length from 8 – 36 cm with a modal length of 10 cm. Eighty-two Pacific sanddab were measured in the southern region in depth stratum 1 (Appendix Table 8). Pacific sanddab ranged in length from 10 – 31 cm with a modal length of 17 cm.

DISCUSSION

This survey represents the fourth year in the 2003 – 2006 time series of trawl surveys for young-of-the-year lingcod at index sites in the Strait of Georgia (Haggarty *et al.* 2005; Haggarty *et al.* 2004; Surry *et al.* 2005), and provides density estimates that can be compared to those obtained from a similar survey in 1991 (Workman *et al.* 1992). Density estimates of young-of-the-year lingcod in 2006 were significantly higher than in 2005 at all sites

surveyed in the northern, southern, and southwestern regions. The southern and southwestern regions are particularly notable, as in 2005 only 12 young-of-the-year lingcod were captured in the south and none were captured in the southwest, while in 2006, 129 young-of-the-year lingcod were captured in the south and 70 were captured in the southwest. Density estimates in 2006 in the south were the highest of the 2003 – 2006 time series, and were comparable to estimates obtained in 1991.

Haggarty and King (2007) compared egg mass densities in 2006 to those from previous years at a number of index sites near Nanaimo and Campbell River in the Strait of Georgia with no significant differences observed, suggesting that the increase in young-of-the-year densities observed in 2006 was not the result of an increase in egg mass densities that year, at least in the areas where egg masses were counted. An increase in young-of-the-year density in 2006, while possibly indicative of future year class success, should not be interpreted as evidence of an increase in spawning lingcod biomass prior to 2006. Young-of-the-year density is likely heavily influenced by larval and post-larval survival rates, and is likely related to favourable environmental conditions during the spring of 2006. Further consideration should be given to examining data relating to environmental conditions and abundance of prey species such as herring and zooplankton in the Strait of Georgia in 2006.

The gadid (cod) species Pacific cod (*Gadus macrocephalus*), tomcod (*Microgadus proximus*), and walleye pollock (*Theragra chalcogramma*) are common bycatch species in the 1991 and 2003 – 2006 young-of-the-year lingcod trawl surveys, of which most individuals belong to the age-0 year class, based on length frequency data collected each year. Box plots of cod densities for the 1991; 2003 – 2006 time series and the 2003 – 2006 time series show increased densities in 2006, especially in the south, similar to the increase observed for lingcod (Appendix Figure 2). Young-of-the-year cod share habitat with young-of-the-year lingcod, and the same environmental conditions likely influence survival of both. In addition, young-of-the-year lingcod prey on small cod, so an increase in cod abundance is indicative of an increased food supply for juvenile lingcod.

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Table 1. Names, locations, habitat type, and years sampled for index sites in the Strait of Georgia, 2006 bottom trawl survey of young-of-the-year lingcod, *CCGS Neocaligus*, July 28 – August 9, 2006.

Statistical Area	Site Code	Site Name	Approximate Location			Habitat Type[1]	Years Sampled
Eastern Region							
16	TH	Thormanby Island	49° 48.98' N	X	125° 0.52' W	S, SR	2004 – 2006
29	SB	Spanish Banks	49° 38.13' N	X	124° 53.82' W	SM	2004 – 2006
29	WC	Wilson Creek	49° 24.17' N	X	124° 34.78' W	S, SR	2004 – 2006
Northern Region							
13	OB	Oyster Bay	48° 54.27' N	X	123° 29.68' W	SR	2003 – 2006
14	BC	Black Creek	48° 31.57' N	X	123° 19.99' W	S	2003 – 2006
14	BW	Bowser	49° 3.04' N	X	123° 16.93' W	S	1991, 2003 – 2006
14	CL	Cape Lazo	48° 42.32' N	X	123° 19.12' W	S, SR	1991, 2003 – 2006
14	CX	Comox	49° 13.28' N	X	123° 56.39' W	SM	1991, 2003 – 2006
14	FC	French Creek	49° 17.6' N	X	123° 14.89' W	S, SR	2003 – 2006
14	KC	Kitty Coleman	50° 3.22' N	X	125° 3.25' W	S, SR	2003 – 2006
14	QU	Qualicum	48° 21.62' N	X	123° 30.85' W	S, SR, SM	1991, 2003 – 2006
Southern Region							
17	KU	Kuper Island	49° 19.02' N	X	124° 14.27' W	SM	2003 – 2006
17	LZ	Lantzville	49° 51.43' N	X	125° 4.95' W	SR	1991, 2004 – 2006
17	NN	Nanaimo	49° 30.03' N	X	124° 2.02' W	SR	1991, 2004 – 2006
17	NS	Nanoose	48° 59.18' N	X	123° 38.53' W	M	1991, 2003 – 2006
17	PY	Pylades Channel	48° 35.9' N	X	123° 20.72' W	S, SR	1991, 2003 – 2006
17	WH	Walker Hook	49° 54.62' N	X	125° 8.82' W	SM	1991, 2003 – 2006
18	FH	Fulford Harbour	48° 23.96' N	X	123° 19.43' W	S	1991, 2003 – 2006
19	SD	Sidney	49° 20.17' N	X	124° 18.63' W	S, SR	1991, 2003 – 2006
Southwestern Region							
19	AH	Albert Head	48° 24.27' N	X	123° 27.7' W	S	2005 – 2006
19	PB	Parry Bay	48° 44.88' N	X	123° 25.97' W	S	2005 – 2006

[1]Habitat types: S = Sand; R = Rock; M = Mud.

Table 2. Depth strata (DS) utilized during the 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, CCGS Neocaligus, July 28 – August 9, 2006. For 15 – 25 m, depth strata are 10 m wide and are the same as those utilized in 2005, while for depths greater than 35 m, depth strata are 20 m wide, compared to only 10 m wide in the 2005 survey. For reference, the depth strata utilized during the 2005 survey are included (Surry et al. 2005).

Depth Stratum (DS)	Depth Range (m)	DS used in 2005
1	15 – 25	1
2	26 – 35	2
3	36 – 55	3 & 4
4	56 – 75	5 & 6
5	76 – 95	7 & 8

Table 3. Common and scientific names of fishes and invertebrates caught during the 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. The total catch weight and total number of pieces for each species is presented, along with the proportion of each to the total catch of the survey. Totals for each species group are in bold text. "Trace" indicates catches less than 0.1 kg. Tow-by-tow catch summaries are presented in Appendix Table 4.

Common name	Scientific name	Total weight (kg)	%	Total count Pieces	%	No. tows	% of tows
FISH SPECIES		**6763.7**	**93.68**	**77208**	**98.69**	**80**	**100.00**
Flatfishes	**Pleuronectiformes**	**3751.6**	**51.96**	**39871**	**50.96**	**80**	**100.00**
Arrowtooth flounder	*Atheresthes stomias*	Trace	--	1	0.00	1	1.25
Butter sole	*Isopsetta isolepis*	4.8	0.07	59	0.08	10	12.50
C-o sole	*Pleuronichthys coenosus*	25.2	0.35	162	0.21	23	28.75
Dover sole	*Microstomus pacificus*	9.1	0.13	152	0.19	17	21.25
English sole	*Parophrys vetulus*	1341.4	18.58	17955	22.95	78	97.50
Flathead sole	*Hippoglossoides elassodon*	71.9	1.00	1017	1.30	33	41.25
Pacific sanddab	*Citharichthys sordidus*	246.2	3.41	1865	2.38	36	45.00
Petrale sole	*Eopsetta jordani*	2.3	0.03	3	0.00	1	1.25
Rex sole	*Glyptocephalus zachirus*	10.7	0.15	99	0.13	13	16.25
Righteye flounders	*Pleuronectidae*	Trace	--	1	0.00	1	1.25
Sand sole	*Psettichthys melanostictus*	19.8	0.27	106	0.14	14	17.50
Slender sole	*Lyopsetta exilis*	243.8	3.38	5421	6.93	42	52.50
Southern rock sole	*Lepidopsetta bilineata*	1468.1	20.33	9778	12.50	76	95.00
Speckled sanddab	*Citharichthys stigmaeus*	53.2	0.74	2657	3.40	57	71.25
Starry flounder	*Platichthys stellatus*	255.1	3.53	595	0.76	29	36.25
Cartilaginous fishes	**Chondrichthyes**	**2186.0**	**30.28**	**1563**	**2.00**	**76**	**95.00**
Big skate	*Raja binoculata*	47.3	0.66	9	0.01	9	11.25
Longnose skate	*Raja rhina*	8.0	0.11	9	0.01	9	11.25
Skate egg cases	*Raja sp.*	0.5	0.01	2	0.00	1	1.25
Spiny dogfish	*Squalus acanthias*	2007.2	27.80	1308	1.67	73	91.25
Spotted ratfish	*Hydrolagus colliei*	123.0	1.70	235	0.30	16	20.00
Plainfin Midshipman	***Porichthys notatus***	**226.3**	**3.13**	**4019**	**5.14**	**64**	**80.00**
Blackbelly Eelpout	***Lycodes pacificus***	**141.1**	**1.95**	**6779**	**8.67**	**32**	**40.00**
Cods	**Gadidae**	**137.8**	**1.91**	**11676**	**14.92**	**74**	**92.50**
Pacific cod	*Gadus macrocephalus*	55.9	0.77	2986	3.82	51	63.75
Pacific hake	*Merluccius productus*	4.7	0.07	43	0.05	5	6.25
Pacific tomcod	*Microgadus proximus*	42.2	0.59	2551	3.26	40	50.00
Walleye pollock	*Theragra chalcogramma*	35.0	0.48	6096	7.79	37	46.25
Surfperches	**Embiotocidae**	**111.6**	**1.55**	**6677**	**8.53**	**56**	**70.00**
Pile perch	*Rhacochilus vacca*	2.6	0.04	18	0.02	3	3.75
Shiner perch	*Cymatogaster aggregata*	109.1	1.51	6659	8.51	56	70.00
Sculpins	**Cottidae**	**74.3**	**1.03**	**1490**	**1.90**	**72**	**90.00**
Buffalo sculpin	*Enophrys bison*	0.4	0.00	9	0.01	2	2.50
Cabezon	*Scorpaenichthys marmoratus*	22.2	0.31	6	0.01	4	5.00
Great sculpin	*Myoxocephalus polyacanthocephalus*	21.2	0.29	30	0.04	7	8.75
Grunt sculpin	*Rhamphocottus richardsoni*	Trace	--	4	0.01	3	3.75
Northern sculpin	*Icelinus borealis*	0.1	0.00	2	0.00	1	1.25
Pacific staghorn sculpin	*Leptocottus armatus*	6.3	0.09	96	0.12	25	31.25
Padded sculpin	*Artedius fenestralis*	Trace	--	4	0.01	2	2.50
Ribbed sculpin	*Triglops pingeli*	1.5	0.02	102	0.13	5	6.25
Roughback sculpin	*Chitonotus pugetensis*	19.2	0.27	1185	1.51	61	76.25
Roughspine sculpin	*Triglops macellus*	0.1	0.00	5	0.01	2	2.50
Sailfin sculpin	*Nautichthys oculofasciatus*	Trace	--	4	0.01	4	5.00
Sculpin sp.	*Radulinus sp.*	Trace	--	3	0.00	3	3.75
Spotfin sculpin	*Icelinus tenuis*	1.9	0.03	40	0.05	5	6.25
Threadfin sculpin	*Icelinus filamentosus*	1.4	0.02	--	--	1	1.25

Table 3. (Cont.)

Common name	Scientific name	Total weight (kg)	%	Total count Pieces	%	No. tows	% of tows
Greenlings	**Hexagrammidae**	**47.8**	**0.66**	**1697**	**2.17**	**75**	**93.75**
Kelp greenling	*Hexagrammos decagrammus*	Trace	--	9	0.01	4	5.00
Lingcod	*Ophiodon elongatus*	30.3	0.42	1063	1.36	69	86.25
Longspine combfish	*Zaniolepis latipinnis*	4.2	0.06	98	0.13	20	25.00
Whitespotted greenling	*Hexagrammos stelleri*	13.3	0.18	527	0.67	60	75.00
Pricklebacks	**Stichaeidae**	**39.8**	**0.55**	**2323**	**2.97**	**41**	**51.25**
Daubed shanny	*Leptoclinus maculatus*	Trace	--	1	0.00	1	1.25
Decorated warbonnet	*Chirolophis decoratus*	Trace	--	1	0.00	1	1.25
Snake prickleback	*Lumpenus sagitta*	39.8	0.55	2318	2.96	40	50.00
Whitebarred prickleback	*Poroclinus rothrocki*	Trace	--	3	0.00	3	3.75
Rockfishes	***Sebastes sp.***	**24.6**	**0.34**	**87**	**0.11**	**18**	**22.50**
Copper rockfish	*Sebastes caurinus*	11.8	0.16	34	0.04	8	10.00
Greenstriped rockfish	*Sebastes elongatus*	1.8	0.02	17	0.02	4	5.00
Quillback rockfish	*Sebastes maliger*	11.0	0.15	36	0.05	12	15.00
Herrings	**Clupeidae**	**9.2**	**0.13**	**464**	**0.59**	**26**	**32.50**
American shad	*Alosa sapidissima*	0.7	0.01	2	0.00	1	1.25
Pacific herring	*Clupea pallasi*	8.5	0.12	462	0.59	26	32.50
Smelts	**Osmeridae**	**4.5**	**0.06**	**422**	**0.54**	**5**	**6.25**
Eulachon	*Thaleichthys pacificus*	Trace	--	2	0.00	2	2.50
Longfin smelt	*Spirinchus thaleichthys*	4.3	0.06	415	0.53	3	3.75
Surf smelt	*Hypomesus pretiosus*	0.2	0.00	4	0.01	1	1.25
Whitebait smelt	*Allosmerus elongatus*	Trace	--	1	0.00	1	1.25
Poachers	**Agonidae**	**2.4**	**0.03**	**109**	**0.14**	**28**	**35.00**
Blacktip poacher	*Xeneretmus latifrons*	0.2	0.00	28	0.04	4	5.00
Gray starsnout	*Bathyagonus alascanus*	Trace	--	1	0.00	1	1.25
Northern spearnose poacher	*Agonopsis vulsa*	0.3	0.00	20	0.03	11	13.75
Sturgeon poacher	*Podothecus accipenserinus*	1.9	0.03	60	0.08	16	20.00
Other fish	**Other fish**	**6.7**	**0.09**	**31**	**0.04**	**18**	**22.50**
Bay goby	*Lepidogobius lepidus*	Trace	--	3	0.00	2	2.50
Dwarf wrymouth	*Cryptacanthodes aleutensis*	Trace	--	1	0.00	1	1.25
Northern ronquil	*Ronquilus jordani*	Trace	--	11	0.01	6	7.50
Pacific sandfish	*Trichodon trichodon*	Trace	--	3	0.00	3	3.75
Slimy snailfish	*Liparis mucosus*	Trace	--	4	0.01	4	5.00
Tube snout	*Aulorhynchus flavidus*	Trace	--	8	0.01	3	3.75
Wolf eel	*Anarrhichthys ocellatus*	6.7	0.09	1	0.00	1	1.25
INVERTEBRATE SPECIES		**456.0**	**6.32**	**1026**	**1.31**	**78**	**97.50**
Crabs and shrimps	**Decapoda**	**198.3**	**2.75**	**406**	**0.52**	**54**	**67.50**
Coonstripe shrimp	*Pandalus danae*	30.3	0.42	18	0.02	16	20.00
Crangons	*Crangon sp.*	Trace	--	1	0.00	2	2.50
Cryptic kelp crab	*Pugettia richii*	Trace	--	--	--	1	1.25
Dungeness crab	*Cancer magister*	85.6	1.19	234	0.30	26	32.50
Ghost shrimp	Upogebiidae	Trace	--	1	0.00	1	1.25
Graceful rock crab	*Cancer gracilis*	2.1	0.03	33	0.04	10	12.50
Hermit crab	*Pagurus sp.*	Trace	--	1	0.00	1	1.25
Humpback shrimp	*Pandalus hypsinotus*	26.7	0.37	--	--	7	8.75
Inshore tanner crab	*Chionoecetes bairdi*	0.7	0.01	3	0.00	2	2.50
Northern kelp crab	*Pugettia producta*	Trace	--	--	--	1	1.25
Pink shrimp	*Pandalus borealis*	Trace	--	0	0.00	1	1.25
Prawn	*Pandalus platyceros*	37.4	0.52	39	0.05	7	8.75
Puget Sound king crab	*Lopholithodes mandtii*	Trace	--	1	0.00	1	1.25
Red rock crab	*Cancer productus*	15.5	0.22	75	0.10	22	27.50
Shrimp	Nantantia	Trace	--	--	--	1	1.25
Spider crabs	Majidae	Trace	--	--	--	2	2.50
Anemones and sea pens	**Anthozoa**	**139.6**	**1.93**	**323**	**0.41**	**40**	**50.00**
Anemone	Actiniaria	Trace	--	1	0.00	1	1.25
Giant plumose anemone	*Metridium sp.*	139.4	1.93	319	0.41	36	45.00
Sea pen	*Ptilosarcus gurneyi*	0.2	0.00	3	0.00	2	2.50
Sea whip	*Osteocella septentrionalis*	Trace	--	--	--	3	3.75

Table 3 (Cont.)

Common name	Scientific name	Total weight (kg)	%	Total count Pieces	%	No. tows	% of tows
Sea stars	**Asteroidea**	**87.6**	**1.21**	**162**	**0.21**	**45**	**56.25**
Bat star	*Patiria miniata*	Trace	--	--	--	1	1.25
Blood star	*Henricia sp.*	0.2	0.00	2	0.00	2	2.50
Cushion star	*Pteraster tesselatus*	0.3	0.00	1	0.00	1	1.25
Leather star	*Dermasterias imbricata*	0.4	0.01	2	0.00	2	2.50
Long-armed sea star	*Orthasterias koehleri*	0.2	0.00	1	0.00	1	1.25
Mottled star	*Evasterias trochelii*	2.9	0.04	19	0.02	6	7.50
Mud star	*Ctenodiscus crispatus*	1.2	0.02	8	0.01	6	7.50
Pink short-spined star	*Pisaster brevispinus*	34.5	0.48	23	0.03	17	21.25
Purple starfish	*Pisaster ochraceus*	0.5	0.01	2	0.00	1	1.25
Rose starfish	*Crossaster papposus*	0.2	0.00	5	0.01	5	6.25
Spiny red sea star	*Hippasteria spinosa*	2.0	0.03	6	0.01	4	5.00
Striped sun starfish	*Solaster stimpsoni*	0.1	0.00	1	0.00	1	1.25
Sunflower starfish	*Pycnopodia helianthoides*	45.0	0.62	89	0.11	28	35.00
Vermillion starfish	*Mediaster aequalis*	Trace	--	3	0.00	3	3.75
Sea cucumbers	**Holothuroidea**	**20.8**	**0.29**	**28**	**0.04**	**5**	**6.25**
Giant red sea cucumber	*Parastichopus californicus*	20.8	0.29	25	0.03	2	2.50
Sea cucumbers	Holothuroidea	Trace	--	3	0.00	3	3.75
Bivalve Molluscs	**Bivalvia**	**2.1**	**0.03**	**59**	**0.08**	**8**	**10.00**
Smooth pink scallop	*Chlamys rubida*	1.0	0.01	32	0.04	6	7.50
Spiny pink scallop	*Chlamys hastata*	1.1	0.02	27	0.03	2	2.50
Squids and octopus	**Cephalopoda**	**0.9**	**0.01**	**28**	**0.04**	**8**	**10.00**
Octopus	Octopoda	0.2	0.00	2	0.00	2	2.50
Opalescent Inshore Squid	*Loligo opalescens*	0.7	0.01	23	0.03	4	5.00
Pacific Bobtail Squid	*Rossia pacifica*	Trace	--	3	0.00	3	3.75
Snails and whelks	**Prosobranchia**	**0.5**	**0.01**	**5**	**0.01**	**4**	**5.00**
Dogwhelks	Nassariidae	Trace	--	1	0.00	1	1.25
Oregontriton	*Fusitriton oregonensis*	0.5	0.01	4	0.01	3	3.75
Urchins	**Echinoidea**	**0.1**	**0.00**	**4**	**0.01**	**4**	**5.00**
Green urchin	*Strongylocentrotus droebachiensis*	0.1	0.00	3	0.00	3	3.75
Red urchin	*Strongylocentrotus franciscanus*	Trace	--	1	0.00	1	1.25
Nudibranchs (sea slugs)	**Nudibranchia**	**Trace**	**--**	**4**	**0.01**	**3**	**3.75**
Arminid nudibranch	*Arminia sp.*	Trace	--	1	0.00	1	1.25
Nudibranchs (Seaslugs)	Nudibranchia	Trace	--	1	0.00	1	1.25
Rosy tritonia	*Tritonia diomedea*	Trace	--	2	0.00	2	2.50
Other invertebrates	**Other invertebrates**	**6.1**	**0.08**	**7**	**0.01**	**7**	**8.75**
Giant Barnacle	*Balanus nubilis*	1.0	0.01	3	0.00	1	1.25
Polychaete worms	Polychaeta	Trace	--	2	0.00	1	1.25
Ribbon worm	Nemertina	Trace	--	--	--	1	1.25
Segmented worms	Annelida	Trace	--	1	0.00	1	1.25
Sponges	Porifera	5.1	0.07	--	--	1	1.25
Tunicates	Ascidiacea	Trace	--	1	0.00	2	2.50
TOTAL ALL SPECIES		**7219.7**	**100.00**	**78234**	**100.00**	**80**	**100.00**

Table 4. Young-of-the-year (YOY) lingcod density summary statistics (standard deviation = SD, coefficient of variation = CV) by site and region, and results of Kruskal-Wallace Nonparametric Analysis of Variance (Kruskal-Wallace Chi-Square = χ^2 and degrees of freedom = df) comparing density among depth strata (DS) and sites by region, 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. For site information, refer to Table 1. For definitions of depth strata, refer to Table 2. Significant p-values at the $\alpha = 0.05$ level are indicated in bold type. Tests were performed using the *kruskal.test* function in S-PLUS version 6.0 for Windows (Insightful Corporation 1988 – 2001).

Site	No. Tows	Depth Strata Fished	No. YOY	Density (number YOY / km ^{2}) per Tow					Kruskal-Wallace Parameters			
				Median	Range	Mean	SD	CV (%)	χ^2	df	p-value	Variable
Northern Region												
BC	4	1,2	207	4249	2182 – 11302	5496	4279	78	2.4	1	0.1213	DS
BW	4	1,2	38	1063	323 – 1737	1046	601	57	0.6	1	0.4386	DS
CL	9	1,2,3,4	101	1570	232 – 2099	1387	623	45	1.71	3	0.6345	DS
CX	4	1,2	84	2135	1201 – 5363	2708	1880	69	2.4	1	0.1213	DS
FC	5	1,2,3	64	1367	566 – 1963	1416	556	39	1.4	2	0.4966	DS
KC	4	1,2	59	2830	804 – 5932	3099	2327	75	2.4	1	0.1213	DS
OB	4	1,2	131	1876	748 – 10713	3803	4714	124	2.4	1	0.1213	DS
QU	8	1,2,3,4	179	2270	815 – 4729	2596	1431	55	4.5	3	0.2123	DS
all	42	--	863	1793	232 – 11302	2499	2410	96	12.3	7	0.0905	Site
Southern Region												
FH	3	2	26	416	244 – 2298	986	1140	116	--	--	--	DS
KU	4	1,2	17	364	263 – 923	478	301	63	0.6	1	0.4386	DS
NN	1	3	9	1103	1103	1103	--	-	--	--	--	DS
NS	5	1,2,3	14	249	134 – 676	362	263	73	3.2	2	0.2019	DS
PY	2	3,3	32	3072	2621 – 3522	3072	637	21	1	1	0.3173	DS
SD	4	1,2,3	29	509	109 – 1957	771	865	112	0.3	2	0.8607	DS
WH	2	1,2,3	2	57	0 – 122	59	68	116	2.67	2	0.2636	DS
all	23	--	129	339	0 – 3522	750	950	127	**13.7**	**6**	**0.0329**	**Site**
Southwestern Region												
AH	2	1,2	31	2210	1649 – 2771	2210	793	36	1.0	1	0.3173	DS
PB	4	2,3	39	1239	629 – 1380	1122	349	31	1.8	1	0.1797	DS
all	6	--	70	1368	629 – 2771	1485	718	48	3.4	1	0.0641	Site
Eastern Region												
SB	2	2	0	0	0	0	0	--	--	--	--	DS
TH	2	2,3	0	0	0	0	0	--	--	1	--	DS
WC	2	3	0	0	0	0	0	--	--	--	--	DS
all	6	--	0	0	0	0	0					Site

Table 5. Results of non-parametric (rank-based) Tukey-type multiple comparisons of young-of-the-year lingcod density among sites for the southern region of the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. Mean ranks ($\overline{R}_B$ and $\overline{R}_A$), sample size (n_B and n_A), standard error (SE), and test statistics (Q), for the first two pairwise comparisons are presented. The critical value ($Q_{\alpha,k}$) at the $\alpha = 0.05$ significance level with $k = 7$ sites and corresponding p-value [$P(Q_\alpha) \leq 0.0012$] was obtained from Zar (1999). For site definitions and descriptions, refer to Table 1.

Comparison (B vs. A)	$\overline{R}_B$	$\overline{R}_A$	n_B	n_A	$\overline{R}_B - \overline{R}_A$	SE	Test Statistic Q	Critical Value $Q_{0.05,7}$	H_0: density the same for sites B and A.
PY vs. WH	22.50	3.00	2	4	19.50	5.87	3.321	3.038	Reject H_0 (density is significantly different between PY and WH)
PY vs. NS	22.50	10.80	2	5	11.70	5.67	2.062	3.038	Do not reject H_0 (density is not significantly different between PY and NS, and between all the pairs enclosed by these two)
NN vs. WH	19.00	3.00	1	4	16.00	7.58	2.111	3.038	Do not reject H_0 (density is not significantly different between NN and WH, and between all the pairs enclosed by these two)

Note: Sites were ordered from smallest to largest mean rank ($\overline{R}$): WH ($\overline{R}$ = 3.00); NS ($\overline{R}$ = 10.80); SD ($\overline{R}$ = 12.00) ; KU ($\overline{R}$ = 13.50) ; FH ($\overline{R}$ = 14.67) ; NN ($\overline{R}$ = 19.00) ; PY ($\overline{R}$ = 22.50). Comparisons are performed starting with the largest mean rank compared to the smallest, followed by the largest compared to the next smallest, and so on. For any pairwise comparison, between $\overline{R}_B$ and $\overline{R}_A$, if H_0 is not rejected (i.e. density is not significantly different between site B and site A), no further pairwise comparisons are required among $\overline{R}$'s that fall between $\overline{R}_B$ and $\overline{R}_A$ in the ranking.

Table 6. Comparison of young-of-the year lingcod density estimates among the northern and southern regions of the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006, using the Mann-Whitney non-parametric test (Zar 1999). Density is shown to be significantly higher in the northern region ($p = 0.0001$). P-values for the Z distribution were obtained using the *pnorm* function in S-PLUS version 6.0 for Windows (Insightful Corporation 1988 – 2001)

Region	Rank Sum	n	Test Statistic	Critical Value	p
North	1842	45	$Z = 3.75$	$Z_{0.05(1)} = t_{0.05(1),\infty} = 1.6449$	0.0001
South	504	23			

Table 7. Young-of-the-year (YOY) lingcod density summary statistics (standard deviation = SD, coefficient of variation = CV) by region for sites sampled in every year of 1991 and 2003 – 2006 and for sites sampled in every year of 2003 – 2006. Only data from depth strata 1 – 3 are included. For definitions of depth strata, refer to Table 2. For site information, refer to Table 1.

year	No. Tows	No. YOY	Density (number YOY / km^2)				
			Median	Range	Mean	SD	CV (%)
Northern region 1991 and 2003 – 2006 (Sites: BW, CL, CX, QU)							
1991	19	252	774	113 – 11155	1686	2583	153
2003	21	368	2403	295 – 9958	2941	2401	82
2004	20	334	1431	0 – 5469	1995	1521	76
2005	20	188	717	117 – 2821	1113	829	75
2006	21	317	1593	323 – 5363	1831	1183	65
Southern region 1991 and 2003 – 2006 (Sites: FH, KU, NS, SD, WH)							
1991	16	77	219	0 – 3361	581	911	157
2003	17	11	0	0 – 1136	101	284	280
2004	17	36	0	0 – 1965	244	505	207
2005	19	8	0	0 – 537	54	147	271
2006	20	88	256	0 – 2298	500	619	124
Northern region 2003 – 2006 (Sites: BC, BW, CL, CX, FC, KC, OB, QU)							
2003	36	602	1927	0 – 9958	2792	2430	87
2004	33	627	1679	0 – 6956	2227	1780	80
2005	37	341	683	0 – 6481	1117	1362	122
2006	38	778	1793	323 – 11302	2503	2474	99
Southern region 2003 – 2006 (Sites: FH, KU, NS, PY, SD, WH)							
2003	19	16	0	0 – 1136	130	288	222
2004	19	45	0	0 – 1965	274	485	177
2005	21	12	0	0 – 537	72	167	234
2006	22	120	301	0 – 3522	734	969	132

Table 8. Comparison of young-of-the year lingcod density estimates between 2005 and 2006 in the northern, southern, and southwestern regions of the Strait of Georgia in depth strata 1– 3, using the Mann-Whitney non-parametric rank-based test (Zar 1999). Density is shown to be higher in 2006 than in 2005 for each region ($p < 0.0025$). P-values for the Z distribution were obtained using the *pnorm* function in S-PLUS version 6.0 for Windows (Insightful Corporation 1988 – 2001) while p-values for the U distribution were obtained from Zar (1999). For information about sites and depth strata, refer to Tables 1 and 2.

Year	No. Tows	Density (fish/km^2)		Mann-Whitney Test Statistic	Critical Value	p-value
		Mean (SD)	Median			
Northern Region						
2006	38	2503 (2474)	1793	$Z = 3.98$	$Z_{0.05(1)} = t_{0.05(1),\infty} = 1.6449$	0.00003
2005	37	1117 (1362)	683			
Southern Region						
2006	23	750 (950)	339	$Z = 4.26$	$Z_{0.05(1)} = t_{0.05(1),\infty} = 1.6449$	0.00001
2005	23	74 (162)	0			
Southwestern Region						
2006	6	1485 (718)	1368	$U' = 36$	$U_{0.05(1),6,6} = 29$	< 0.0025
2005	6	0	0			

Table 9. Number of fish sampled (N) and summary statistics (median, mean, standard deviation = SD, coefficient of variation = CV) for length, weight, and condition factor of young-of-the-year lingcod by site for the northern, southern, and southwestern regions, 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. For site information, refer to Table 1.

		Length (mm)					Weight (g)					Condition Factor (x 10^{-5})				
Site	N	Median	Range	Mean	SD	CV (%)	Median	Range	Mean	SD	CV (%)	Median	Range	Mean	SD	CV (%)
Northern Region																
BC	206	159	129 – 198	158.88	10.77	7	28	10 – 52	26.75	6.68	25	0.65	0.47 – 0.89	0.65	0.07	10
BW	38	151.5	116 – 174	149.32	13.6	9	24	8 – 36	23.05	7.24	31	0.66	0.51 – 0.84	0.67	0.08	11
CL	101	151	118 – 173	150.4	11.47	8	22	10 – 36	22.48	6.09	27	0.64	0.5 – 0.83	0.65	0.07	11
CX	84	150	123 – 185	151	12.6	8	22	1? – 44	23.62	6.57	28	0.67	0.55 – 0.83	0.67	0.07	10
FC	64	147	114 – 190	147.14	15.66	11	20	10 – 46	22	7.7	35	0.655	0.55 – 0.8	0.66	0.06	8
KC	59	154	122 – 174	153.17	11.21	7	24	12 – 42	24.85	6.1	25	0.68	0.53 – 0.84	0.68	0.06	9
OB	131	160	133 – 186	158.38	10.34	7	26	16 – 50	26.84	6.62	25	0.67	0.46 – 0.79	0.66	0.06	9
QU	179	144	99 – 195	144.42	18.52	13	19	4 – 56	20.45	8.95	44	0.63	0.41 – 0.89	0.64	0.08	12
Total	862	154	99 – 198	152.36	14.53	10	24	4 – 56	24	7.6	32	0.66	0.41 – 0.89	0.66	0.07	11
Southern Region																
FH	26	156.5	123 – 177	156	9.26	6	26	12 – 36	25.88	4.98	19	0.67	0.58 – 0.83	0.67	0.06	8
KU	17	159	135 – 173	155.47	11.23	7	26	16 – 34	25.06	5.06	20	0.66	0.61 – 0.72	0.66	0.03	5
NN	9	167	158 – 174	166.67	6.08	4	32	26 – 36	31.33	4.24	14	0.67	0.59 – 0.76	0.67	0.04	7
NS	14	146	102 – 182	141.31	24.06	17	20	4 – 40	19	9.92	52	0.6	0.38 – 0.68	0.58	0.09	15
PY	32	163	152 – 185	165.13	9.19	6	28	22 – 42	29.38	5.73	20	0.63	0.57 – 0.74	0.64	0.04	6
SD	29	147	117 – 171	145.03	11.95	8	20	12 – 32	20.76	4.94	24	0.66	0.57 – 0.87	0.67	0.07	10
WH	2	156	138 – 174	156	25.46	16	26	16 – 36	26	14.14	54	0.645	0.61 – 0.68	0.65	0.05	8
Total	129	157	102 – 185	154.98	14.99	10	26	4 – 42	25.12	7.06	28	0.66	0.38 – 0.87	0.65	0.06	9
Southwestern Region																
AH	31	148	115 – 184	147.61	19.71	13	20	10 – 42	21.61	9.26	43	0.63	0.51 – 0.79	0.63	0.06	10
PB	39	145	119 – 206	152.08	22.45	15	20	10 – 62	24.21	12.53	52	0.63	0.52 – 0.76	0.64	0.06	9
Total	70	145	115 – 206	150.1	21.25	14	20	10 – 62	23.06	11.2	49	0.63	0.51 – 0.79	0.63	0.06	9

Table 10. Summary of diet information for young-of-the-year lingcod, 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006.

	Number of Stomachs	Percent of Stomachs
Examined	596	--
With prey items	429	72.0
With identifiable prey items	396	66.4
With 1 prey item	361	60.6
With 2 prey items	8	1.3

Table 11. Prey items identified in the stomach contents of young-of-the-year lingcod, 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. Digestion Stages are described in Appendix Table 2. N is the number of occurrences of each prey type, % of Volume is the proportion of total prey volume accounted for by each prey type, and % of Contents is the average proportion of individual volume of stomach contents accounted for by each prey type.

Prey Item	N	Percent At Each Digestion Stage					Frequency Occurrence (%)	Mean Volume (cm^3)	SD of Volume	% of Contents
		1	2	3	4	5				
Fish prey										
Fish remains	191				6.8	93.2	50.66	0.81	0.72	97.49
Pacific Herring	93	2.2	6.5	34.4	43.0	14.0	24.67	2.62	1.05	98.82
Pacific Sand Lance	14		7.1	28.6	64.3		3.71	1.43	0.55	100.00
Gadoid fishes	8			25.0	62.5	12.5	2.12	3.06	1.45	97.92
Roughback Sculpin	2	50.0		50.0			0.53	1.25	0.35	100.00
Pacific Cod	1			100.0			0.27	5.00	--	100.00
Snake Prickleback	1	100.0					0.27	2.00	--	100.00
Blacktip Poacher	1	100.0					0.27	2.00	--	100.00
Flatfishes	1				100.0		0.27	1.00	--	100.00
Rock sole	1			100.0			0.27	1.00	--	100.00
English sole	1		100.0				0.27	1.00	--	50.00
Invertebrate prey										
Crustaceans	33			15.2	33.3	51.5	8.75	0.19	0.27	97.83
Mysids	16		12.5	31.3	43.8	12.5	4.24	0.65	0.43	94.05
Shrimp	6	16.7	16.7	16.7	33.3	16.7	1.59	0.45	0.53	97.22
Euphausiids	3		33.3	66.7			0.80	0.07	0.06	100.00
Decapods	3				66.7	33.3	0.80	0.70	1.13	100.00
Humpback Shrimp	2	50.0				50.0	0.53	0.30	0.28	100.00

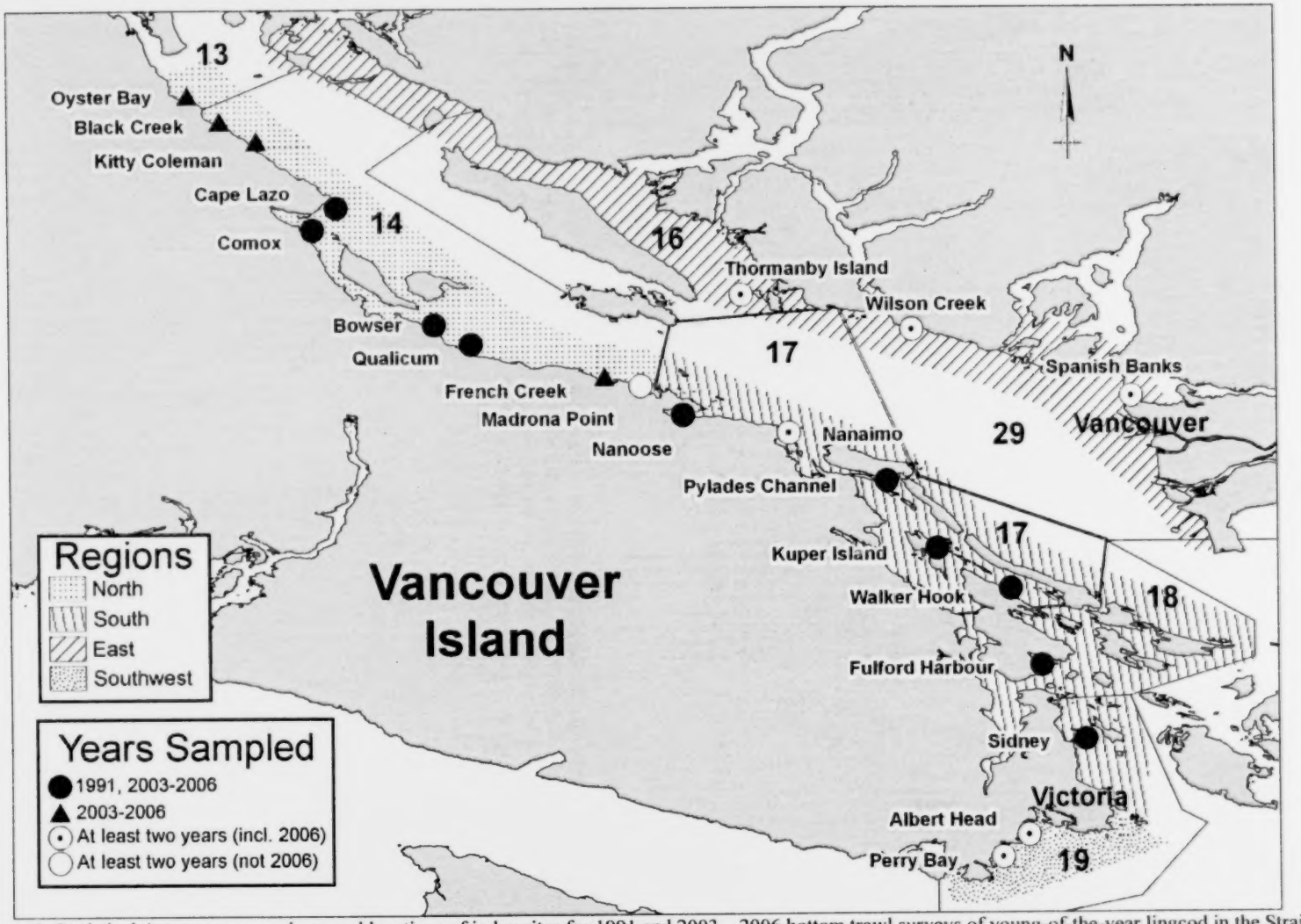


Figure 1. Statistical Areas, survey regions, and locations of index sites for 1991 and 2003 – 2006 bottom trawl surveys of young-of-the-year lingcod in the Strait of Georgia. Only sites sampled in two or more years are included.

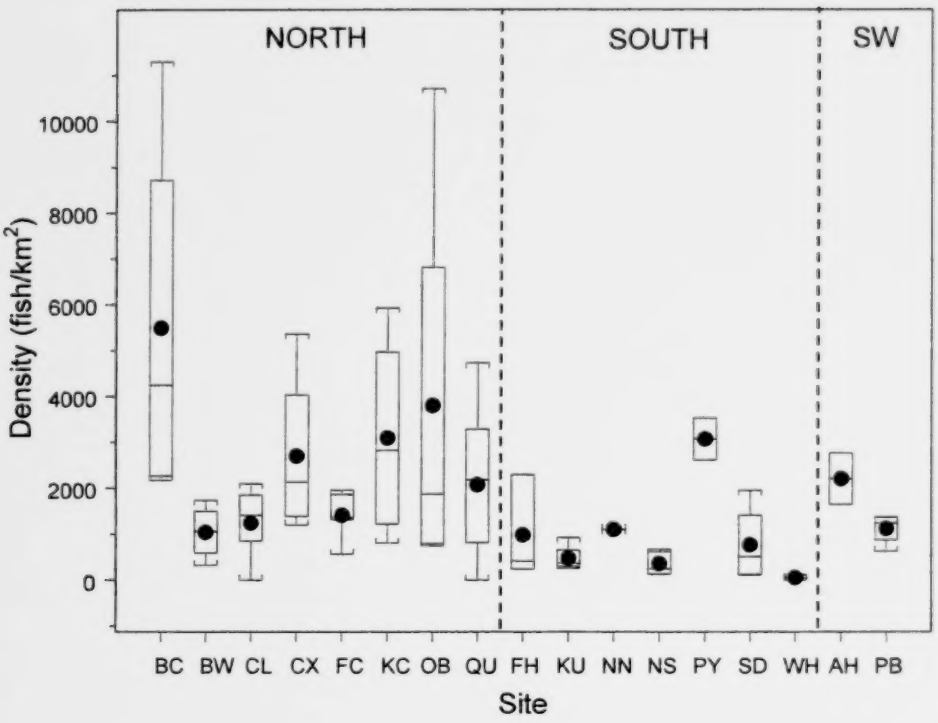


Figure 2. Box plot representing the density (fish/km^2) of young-of-the-year lingcod by site and region during the 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. The horizontal line in the centre of each box represents the median, while box edges depict the 1st and 3rd quartiles. The range of the data are represented by the whiskers. The mean density is represented by •.

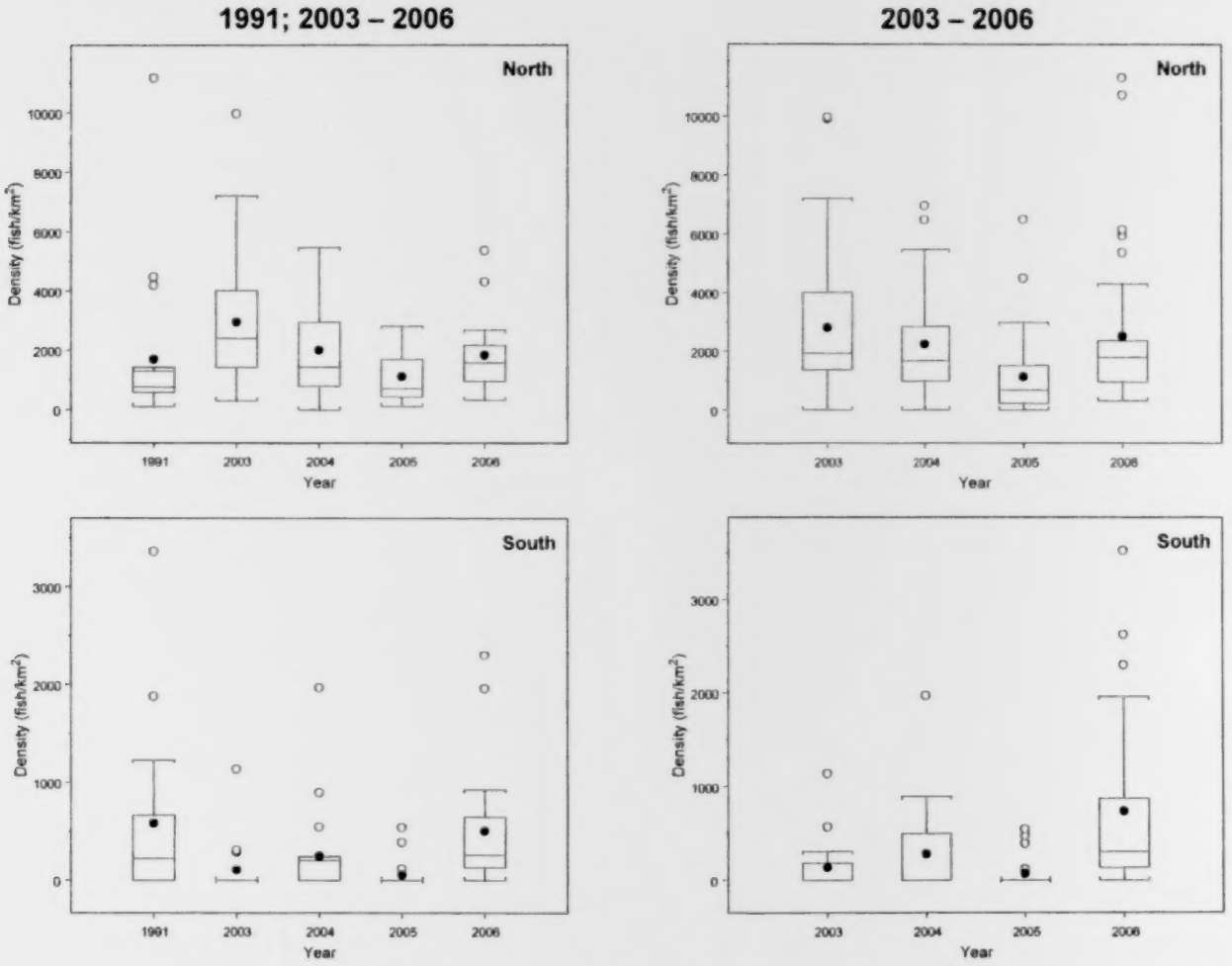


Figure 3. Box plots representing the density (fish/km^2) of young-of-the-year lingcod by survey year for the northern and southern regions of the Strait of Georgia for bottom trawl surveys at sites visited every year in the 1991; 2003 – 2006 time series and in the 2003 – 2006 time series. The horizontal line in the centre of each box represents the median, while box edges depict the 1st and 3rd quartiles. The range of the data are represented by the whiskers, while outliers are represented by ○. The mean density is represented by •. For site information, refer to Table 1.

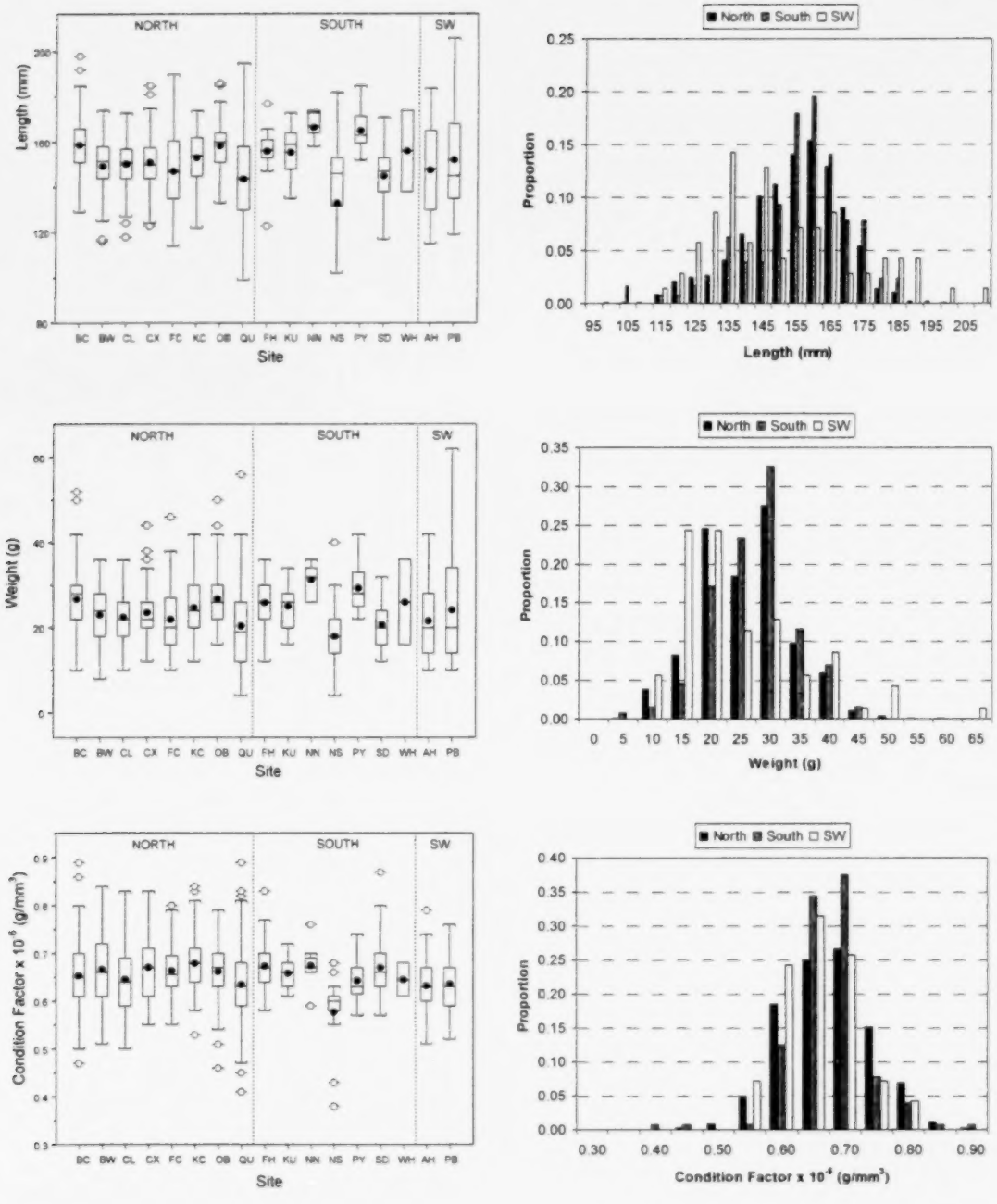


Figure 4. Box plots and histograms representing the length, weight, and condition factor of young-of-the-year lingcod by site and region during the 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. The horizontal line in the centre of each box represents the median, while box edges depict the 1st and 3rd quartiles. The range of the data are represented by the whiskers, while outliers are represented by ○. The mean density is represented by •. For site information, refer to Table 1.

Appendix Table 1. The Beaufort Scale

Beaufort Force	Description	Wind Speed (knots)	Sea State
0	Calm	<1	Sea like mirror
1	Light Air	1 – 3	Ripples, no foam crests
2	Light Breeze	4 – 6	Small wavelets
3	Gentle Breeze	7 – 10	Crests breaking
4	Moderate Breeze	11 – 16	Whitecaps
5	Fresh Breeze	17 – 21	Moderate waves - spray
6	Strong Breeze	22 – 27	Large waves
7	Moderate Gale	28 – 33	Sea heaps up
8	Fresh Gale	34 – 40	Moderately high waves
9	Strong Gale	41 – 47	High waves, spray
10	Whole Gale	48 – 55	Overhanging crests, sea white
11	Storm	56 – 63	Exceptionally high waves
12	Hurricane	64 – 118	Sea white

Appendix Table 2. Stages of digestion for stomach contents of lingcod.

Digestion stage code	Digestion stage description
1	Fresh (no visible digestion)
2	1/4 Digested
3	1/2 Digested
4	3/4 Digested
5	Fully Digested (no identifiable tissue, homogenous fluid, could contain indigestible and identifiable matter such as otoliths).

Appendix Table 3. Bridge log information and lingcod catch density for bottom trawl tows from the 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. For site names refer to Table 1. For definitions of depth strata, refer to Table 2. For the Beaufort Scale, refer to Appendix Table 1. Tows were designated "Unusable" when circumstances required that the net be retrieved early, i.e. due to rocky bottom snagging the net or when tide conditions were extremely unfavourable.

Tow number	1	2	3	4	5	6	7	8	9
Date	July 28	July 28	July 28	July 28	July 28	July 28	July 29	July 29	July 29
Site	LZ	LZ	NS	NS	NS	NS	KU	KU	KU
Region	South	South	South	South	South	South	South	South	South
Statistical Area	17	17	17	17	17	17	17	17	17
Depth Stratum	3	3	2	1	2	2	2	2	1
Start time (PST)	9:31	10:25	12:29	13:26	14:13	15:25	8:03	9:15	10:15
Duration (min)	10	11	10	10	10	10	10	10	10
Start position									
North Latitude	49° 15.2'	49° 15.71'	49° 15.71'	49° 15.61'	49° 15.42'	49° 15.73'	49° 1.17'	49° 0.63'	48° 57.11'
West Longitude	123° 0.22'	123° 6.31'	124° 9.83'	124° 10.06'	124° 8.19'	124° 9.06'	123° 39.14'	123° 39.18'	123° 37.41'
Finish position									
North Latitude	49° 15.22'	49° 15.75'	49° 15.71'	49° 15.52'	49° 15.52'	--	49° 1.32'	49° 0.38'	48° 57.48'
West Longitude	123° 0.74'	123° 6.77'	124° 9.32'	124° 9.61'	124° 8.69'	--	123° 39.57'	123° 38.89'	123° 37.41'
Distance towed (n.mi.)	0.40	0.50	0.40	0.30	0.36	0.30	0.34	0.33	0.34
Distance towed (m)	740.8	926.0	740.8	555.6	666.7	555.6	629.7	611.2	629.7
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)	270	91	90	106	289	101	300	140	14
Bottom depth (m)	45	33	26	22	27	31	35	28	25
Bottom temperature (°C)	9.89	10.15	10.97	11.46	11.01	10.93	11.38	11.49	11.87
Tide	Ebb	Ebb	Ebb	Low Slack	Low Slack	Low Slack	High Slack	Ebb	Ebb
Tide height (feet)	10.2	8.7	5.3	4.3	4	4.6	8.9	8.5	7.6
Beaufort scale	3	3	3	3	3	3	2	3	3
Wind direction	NW	NW	NW	NW	NW	NW	SE	NE	NE
% cloud cover	20	20	90	60	50	50	100	100	100
Total catch (kg)	44.1	96.6	122.1	25.2	140.2	142.3	73.5	31.4	115.3
Number YOY lingcod	9	5	2	1	5	1	3	2	3
Swept area m^2	8160	7400	8034	7462	8145	7223	7738	7608	8842
YOY density (number/km^2)	1103	676	249	134	614	138	388	263	339
Usable tow	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix Table 3 (Cont.)

Tow number	10	11	12	13	14	15	16	17	18
Date	July 29	July 29	July 29	July 30	July 30	July 30	July 30	July 30	July 30
Site	KU	PY	PY	WH	WH	WH	WH	FH	FH
Region	South	South	South	South	South	South	South	South	South
Statistical Area	17	17	17	17	17	17	17	18	18
Depth Stratum	1	3	2	3	1	2	2	2	2
Start time (PST)	11:39	13:52	15:54	10:29	11:42	12:42	13:32	15:20	16:28
Duration (min)	10	9	5	10	10	10	10	10	11
Start position									
North Latitude	48° 58.95'	49° 7.12'	49° 7.26'	48° 54.65'	48° 53.9'	48° 54.43'	48° 54.18'	48° 44.45'	48° 45.31'
West Longitude	123° 37.49'	123° 44.35'	123° 45.24'	123° 29.09'	123° 29.82'	123° 30.39'	123° 29.75'	123° 25.56'	123° 26.34'
Finish position									
North Latitude	48° 57.59'	49° 6.91'	49° 7.12'	48° 54.36'	48° 54.15'	48° 54.73'	48° 54.43'	48° 44.82'	48° 45.03'
West Longitude	123° 37.38'	123° 44.09'	123° 45.19'	123° 28.61'	123° 30.31'	123° 30.37'	123° 30.16'	123° 25.77'	123° 26.95'
Distance towed (n.mi.)	0.33	0.30	0.10	0.50	0.35	0.32	0.30	0.38	0.36
Distance towed (m)	611.2	555.6	185.2	926.0	648.2	592.6	555.6	703.8	666.7
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)	170	140	178	130	304	325	312	335	140
Bottom depth (m)	23	52	30	43	22	27	27	34	26
Bottom temperature (°C)	12.43	10.81	11.23	11.47	12.98	12.34	12.51	11.48	11.6
Tide	Ebb	Low Slack	Low Slack	Ebb	Ebb	Ebb	Low Slack	Low Slack	Flood
Tide height (feet)	7.8	5.5	5.8	7.3	6.2	6.6	6.5	5.1	5.8
Beaufort scale	2	2	3	3	3	3	3	3	3
Wind direction	NE	NE	NE	SW	SW	SW	SW	SW	SW
% cloud cover	100	50	50	50	50	50	50	60	60
Total catch (kg)	138.9	97.5	20.2	62.8	98	59.7	49.1	120.8	144.7
Number YOY lingcod	9	23	9	0	0	1	1	4	2
Swept area m^2	7945	7223	2408	12038	8427	7704	7223	9149	8667
YOY density (number/km^2)	1133	3184	3738	0	0	130	138	437	231
Usable tow	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix Table 3 (Cont.)

Tow number	19	20	21	22	23	24	25	26	27
Date	July 31	July 31	July 31	July 31	July 31	July 31	August 1	August 1	August 1
Site	FH	SD	SD	SD	SD	SD	PB	PB	PB
Region	South	South	South	South	South	South	Southwest	Southwest	Southwest
Statistical Area	18	19	19	19	19	19	19	19	19
Depth Stratum	2	2	3	3	1	1	2	1	2
Start time (PST)	7:17	8:29	10:05	10:25	12:27	13:36	8:21	9:21	11:17
Duration (min)	10	10	3	8	10	10	10	0	10
Start position									
North Latitude	48° 44.9'	48° 38.6'	48° 35.31'	48° 34.46'	48° 32.07'	48° 31.15'	48° 21.16'	48° 21.12'	48° 22.32'
West Longitude	123° 25.94'	123° 21.2'	123° 18.95'	123° 18.66'	123° 18.83'	123° 19.44'	123° 31.34'	123° 31.66'	123° 30.2'
Finish position									
North Latitude	48° 44.58'	48° 38.22'	48° 35.21'	48° 34.74'	48° 32.47'	48° 31.44'	48° 21.53'	--	48° 22.09'
West Longitude	123° 25.71'	123° 21.19'	123° 18.91'	123° 18.67'	123° 18.96'	123° 19.82'	123° 31.09'	--	123° 30.57'
Distance towed (n.mi.)	0.30	0.37	--	0.37	0.36	0.33	0.40	--	0.38
Distance towed (m)	555.6	685.2	--	685.2	666.7	611.2	740.8	--	703.8
Vessel speed (knots)	2	2	2	2	2	2	2	--	2
Direction (°True)	158	180	145	5	355	325	32	--	228
Bottom depth (m)	26	34	43.1	42	24	20	34	--	27
Bottom temperature (°C)	11.82	12.12	--	10.77	12.45	12.41	11.15	--	10.74
Tide	Ebb	Flood	High Slack	High Slack	Ebb	Low Slack	High Slack	--	Low Slack
Tide height (feet)	6.6	6.2	6.5	6.4	5.8	5.4	5.1	--	5.1
Beaufort scale	2	2	1	0	0	0	4	--	4
Wind direction	WSW	WSW	WSW	--	--	--	W	--	W
% cloud cover	20	40	20	40	40	40	50	--	50
Total catch (kg)	64.3	109	0	442.4	37.8	39.8	56.8	0	175.5
Number YOY lingcod	20	8	0	1	19	2	11	0	11
Swept area m^2	7223	8908	--	8908	8667	7945	9630	--	9149
YOY density (number/km^2)	2769	898	0	112	2192	252	1142	0	1202
Usable tow	Y	Y	N	Y	Y	Y	Y	N	Y

Appendix Table 3 (Cont.)

Tow number	28	29	30	31	32	33	34	35	36
Date	August 1	August 1	August 1	August 1	August 2	August 2	August 2	August 2	August 2
Site	PB	PB	AH	AH	FC	FC	FC	FC	FC
Region	Southwest	Southwest	Southwest	Southwest	North	North	North	North	North
Statistical Area	19	19	19	19	14	14	14	14	14
Depth Stratum	3	2	2	1	3	2	2	1	1
Start time (PST)	12:45	13:45	14:38	15:48	10:52	12:09	12:53	13:46	14:34
Duration (min)	10	10	10	7	10	11	11	10	10
Start position									
North Latitude	48° 22.16'	48° 22.87'	48° 24.3'	48° 25.21'	49° 20.46'	49° 20.23'	49° 20.19'	49° 20.26'	49° 20.89'
West Longitude	123° 30.24'	123° 29.62'	123° 28.2'	123° 26.53'	124° 18.57'	124° 18.32'	124° 18.51'	124° 18.84'	124° 20.69'
Finish position									
North Latitude	48° 21.9'	48° 22.54'	48° 23.93'	48° 25.02'	49° 20.61'	49° 20.45'	49° 20.47'	49° 20.46'	49° 20.72'
West Longitude	123° 30.54'	123° 29.83'	123° 28.17'	123° 26.31'	124° 19.14'	124° 18.79'	124° 18.9'	124° 19.31'	124° 20.25'
Distance towed (n.mi.)	0.38	0.34	0.40	0.23	0.37	0.37	0.35	0.31	0.33
Distance towed (m)	703.8	629.7	740.8	426.0	685.2	685.2	648.2	574.1	611.2
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)		208	120	145	290	310	305	306	115
Bottom depth (m)	41	27	34	18	41	33	28	20	20
Bottom temperature (°C)	9.67	11.06	10.89	10.61	9.86	9.89	10.45	11.05	10.82
Tide	Flood	Flood	Flood	Flood	Flood	High Slack	High Slack	High Slack	High Slack
Tide height (feet)	5.3	5.5	5.8	6.5	10.6	11.5	11.9	11.9	11.8
Beaufort scale	5	5	5	5	4	4	4	4	2
Wind direction	W	W	W	W	NE	NE	NE	NE	NE
% cloud cover	50	50	50	50	20	20	20	20	20
Total catch (kg)	68.2	31.2	22.6	29.7	65.9	43.6	24.7	118	19.5
Number YOY lingcod	5	12	15	16	18	18	12	5	11
Swept area m^2	9149	8186	9630	5537	8908	8908	8427	7464	7945
YOY density (number/km^2)	547	1466	1558	2889	2021	2021	1424	670	1385
Usable tow	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix Table 3 (Cont.)

Tow number	37	38	39	40	41	42	43	44	45
Date	August 3	August 3	August 3	August 3	August 3	August 3	August 3	August 3	August 4
Site	QU	QU	QU	QU	QU	QU	QU	QU	QU
Region	North	North	North	North	North	North	North	North	North
Statistical Area	14	14	14	14	14	14	14	14	14
Depth Stratum	1	2	1	2	3	3	4	4	5
Start time (PST)	7:54	9:02	10:13	11:01	13:41	14:35	15:33	16:38	7:35
Duration (min)	10	10	10	10	11	10	10	10	10
Start position									
North Latitude	49° 23.33'	49° 23.57'	49° 23.81'	49° 24.41'	49° 24.6'	49° 23.88'	49° 24.65'	49° 24.04'	49° 25.92'
West Longitude	124° 33.85'	124° 34.83'	124° 35.33'	124° 35.44'	124° 35.32'	124° 34.04'	124° 34.76'	124° 33.45'	124° 34.59'
Finish position									
North Latitude	49° 23.43'	49° 23.88'	49° 23.52'	49° 24.64'	49° 24.34'	49° 23.68'	49° 24.41'	49° 24.31'	49° 24.65'
West Longitude	124° 34.4'	124° 35.16'	124° 35.01'	124° 35.84'	124° 34.98'	124° 33.57'	124° 34.37'	124° 33.82'	124° 34.26'
Distance towed (n.mi.)	0.37	0.35	0.36	0.37	0.31	0.31	0.34	0.38	0.41
Distance towed (m)	685.2	648.2	666.7	685.2	574.1	574.1	629.7	703.8	759.3
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)	300	325	145	320	135	125	130	315	145
Bottom depth (m)	23	27	21	32	42	54	60	72	83
Bottom temperature (°C)	11.4	10.85	11.78	10.59	10.04	9.83	9.67	9.23	9.27
Tide	Low Slack	Flood	Flood	Flood	Flood	High Slack	High Slack	High Slack	Low Slack
Tide height (feet)	5.6	6.5	7.8	9.3	12.2	12.7	12.8	12.6	4.6
Beaufort scale	3	3	1	2	1	1	1	0	2
Wind direction	NW	NW	NW	NW	NW	NW	NW	--	W
% cloud cover	10	10	10	10	10	10	10	10	0
Total catch (kg)	138.9	81	49.3	85.5	156.6	100.2	110	97.7	106.8
Number YOY lingcod	21	20	7	36	18	8	40	29	0
Swept area m^2	8908	8427	8667	8908	7464	7464	8186	9149	9871
YOY density (number/km^2)	2357	2373	808	4041	2412	1072	4886	3170	0
Usable tow	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix Table 3 (Cont.)

Tow number	46	47	48	49	50	51	52	53	54
Date	August 4	August 4	August 4	August 4	August 4	August 4	August 4	August 5	August 5
Site	QU	BW	BW	BW	BW	CX	CX	CX	CL
Region	North	North	North	North	North	North	North	North	North
Statistical Area	14	14	14	14	14	14	14	14	14
Depth Stratum	5	1	1	2	2	2	1	2	3
Start time (PST)	8:32	9:30	10:30	11:59	12:53	14:39	15:36	6:23	7:39
Duration (min)	10	10	11	10	11	10	10	10	10
Start position									
North Latitude	49° 25.09'	49° 25.94'	49° 26.82'	49° 27.08'	49° 26.38'	49° 36.07'	49° 36.35'	49° 38.54'	49° 39.3'
West Longitude	124° 34.71'	124° 38.74'	124° 39.93'	124° 39.88'	124° 38.88'	124° 52.58'	124° 53.24'	124° 54.21'	124° 51.09'
Finish position									
North Latitude	49° 24.83'	49° 26.23'	49° 27.14'	49° 26.84'	49° 26.69'	49° 36.43'	49° 36.69'	49° 38.74'	49° 39.67'
West Longitude	124° 34.3'	124° 39.12'	124° 40.25'	124° 39.47'	124° 39.23'	124° 52.74'	124° 53.4'	124° 54.69'	124° 51.31'
Distance towed (n.mi.)	0.40	0.38	0.38	0.35	0.36	0.39	0.36	0.37	0.31
Distance towed (m)	740.8	703.8	703.8	648.2	666.7	722.3	666.7	685.2	574.1
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)	150	335	325	145	320	345	340	300	
Bottom depth (m)	90	21	20	29	31.8	32	21	31	41
Bottom temperature (°C)	9.19	13.99	12.65					11.28	10.18
Tide	Low Slack	Flood	Flood	Flood	Flood	High Slack	High Slack	Ebb	Ebb
Tide height (feet)	4.6	5.3	6.7	9.2	11	13.6	14.2	6.8	5.2
Beaufort scale	1	1	1	2	2	2	2	1	1
Wind direction	W	W	W	W	W	W	W	NW	NW
% cloud cover	0	0	0	0	0	0	0	40	40
Total catch (kg)	151.1	223	194.1	78.8	91.7	82.3	53.8	79.6	38.9
Number YOY lingcod	0	8	16	11	3	11	23	14	8
Swept area m^2	9630	9149	9149	8427	8667	9390	8667	8908	7464
YOY density (number/km^2)	0	874	1749	1305	346	1172	2654	1572	1072
Usable tow	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix Table 3 (Cont.)

Tow number	55	56	57	58	59	60	61	62	63
Date	August 5	August 5	August 5	August 5	August 5	August 6	August 6	August 6	August 6
Site	CL	CL	CL	CL	CL	CX	CL	CL	CL
Region	North	North	North	North	North	North	North	North	North
Statistical Area	14	14	14	14	14	14	14	14	14
Depth Stratum	3	1	2	4	1	1	1	2	4
Start time (PST)	8:32	9:17	10:16	11:13	13:12	6:46	7:57	8:47	9:36
Duration (min)	7	10	10	11	10	9	10	11	10
Start position									
North Latitude	49° 40.84'	49° 41.05'	49° 40.54'	49° 40.16'	49° 41'	49° 39.57'	49° 43.42'	49° 43.55'	49° 43.96'
West Longitude	124° 51.6'	124° 51.33'	124° 49.48'	124° 49.14'	124° 49.07'	124° 56.01'	124° 51.26'	124° 51.37'	124° 51.13'
Finish position									
North Latitude	49° 40.69'	49° 41.06'	49° 40.45'	49° 39.93'	49° 40.69'	49° 39.32'	49° 43.65'	49° 43.38'	49° 43.72'
West Longitude	124° 51.75'	124° 50.77'	124° 48.93'	124° 48.7'	124° 48.85'	124° 55.8'	124° 51.82'	124° 51.88'	124° 50.73'
Distance towed (n.mi.)	0.21	0.35	0.35	0.36	0.31	0.25	0.38	0.33	0.34
Distance towed (m)	388.9	648.2	648.2	666.7	574.1	463.0	703.8	611.2	629.7
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)	215	90	100	125	150	165	305	115	150
Bottom depth (m)	36	21	30	57	20	22	21	34	65
Bottom temperature (°C)	10.4	11.3	10.39	9.62	10.86	11.16	11	10.04	9.07
Tide	Low Slack	Low Slack	Flood	Flood	Flood	Ebb	Ebb	Low Slack	Low Slack
Tide height (feet)	4.3	4.2	5		11	7.1	5.2	3.8	3.4
Beaufort scale	1	2	2	3	2	2	4	2	2
Wind direction	NW	NW	NW	NW	NW	NW	NW	NW	NW
% cloud cover	40	40	20	20	0	0	0	0	0
Total catch (kg)	38.2	200.5	46.5	55.9	55.8	126.4	121.8	109.7	18.8
Number YOY lingcod	9	11	14	14	17	36	10	16	2
Swept area m^2	5056	8427	8427	8667	7464	6019	9149	7945	8186
YOY density (number/km^2)	1780	1305	1661	1615	2278	5981	1093	2014	244
Usable tow	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix Table 3 (Cont.)

Tow number	64	65	66	67	68	69	70	71	72
Date	August 6	August 6	August 6	August 6	August 6	August 7	August 7	August 7	August 7
Site	CL	KC	KC	KC	KC	OB	OB	OB	OB
Region	North	North	North	North	North	North	North	North	North
Statistical Area	14	14	14	14	14	13	13	13	13
Depth Stratum	5	1	1	2	2	2	2	1	1
Start time (PST)	10:23	12:43	13:26	14:10	14:42	9:27	10:27	11:23	14:00
Duration (min)	10	10	8	5	6	10	10	10	10
Start position									
North Latitude	49° 44.05'	49° 47.52'	49° 48.75'	49° 49.23'	49° 47.71'	49° 54.84'	49° 54.59'	49° 54.19'	49° 54.45'
West Longitude	124° 50.74'	124° 59.03'	125° 0.75'	125° 0.7'	124° 59.17'	125° 8.76'	125° 8.45'	125° 8.57'	125° 9.1'
Finish position									
North Latitude	49° 44.36'	49° 47.77'	49° 48.53'	49° 49.12'	49° 47.85'	49° 55.12'	49° 54.32'	49° 54'	49° 54.18'
West Longitude	124° 51.09'	124° 59.44'	125° 0.56'	125° 0.57'	124° 59.39'	125° 9.12'	125° 8.14'	125° 8.12'	125° 8.75'
Distance towed (n.mi.)	0.36	0.35	0.24	0.12	0.19	0.35	0.34	0.34	0.37
Distance towed (m)	666.7	648.2	444.5	222.2	351.9	648.2	629.7	629.7	685.2
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)	315	300	160	150	315	320	145	130	130
Bottom depth (m)	80	22	21	30	32	28	30	21	18
Bottom temperature (°C)	9.01	10.62	11.02	10.43	10.27	10.04	10.26	10.37	11.82
Tide	Low Slack	Ebb	Flood	Flood	Flood	Ebb	Low Slack	Low Slack	Flood
Tide height (feet)	3.3	5.1	7.6	8.9	10.1	2.1	1.2	1.4	6.7
Beaufort scale	2	2	0	0	0	2	2	2	2
Wind direction	NW	NW	--	--	--	NW	NW	NW	NW
% cloud cover	0	0	0	0	0	20	20	0	40
Total catch (kg)	37.9	103	55.7	32.1	59.2	70.7	40.9	26.8	28.3
Number YOY lingcod	0	7	10	13	29	94	23	7	1
Swept area m^2	8667	8427	5778	2889	4574	8427	8186	8186	8908
YOY density (number/km^2)	0	831	1731	4500	6340	11155	2810	855	112
Usable tow	Y	Y	Y	Y	Y	Y	Y	Y	N

Appendix Table 3 (Cont.)

Tow number	73	74	75	76	77	78	79	80	81
Date	August 7	August 7	August 7	August 8	August 8	August 8	August 8	August 9	August 9
Site	BC	BC	BC	OB	OB	BC	BC	TH	TH
Region	North	North	North	North	North	North	North	East	East
Statistical Area	14	14	14	13	13	14	14	16	16
Depth Stratum	1	2	1	1	1	1	2	2	3
Start time (PST)	14:56	15:43	16:34	10:31	10:46	12:08	12:54	7:11	7:49
Duration (min)	10	10	3	2	10	10	10	4	10
Start position									
North Latitude	49° 51.39'	49° 51.64'	49° 51.88'	49° 54.38'	49° 54.19'	49° 52.3'	49° 51.04'	49° 29.87'	49° 30'
West Longitude	125° 5.12'	125° 4.22'	125° 5.77'	125° 9.07'	125° 8.7'	125° 5.02'	125° 4.14'	124° 2.19'	124° 1.78'
Finish position									
North Latitude	49° 51.7'	49° 51.96'	49° 51.99'	49° 54.35'	49° 54.45'	49° 52.66'	49° 51.3'	49° 29.99'	49° 29.65'
West Longitude	125° 5.51'	125° 4.6'	125° 5.83'	125° 9.02'	125° 9.13'	125° 6.22'	125° 4.59'	124° 2.12'	124° 1.92'
Distance towed (n.mi.)	0.49	0.38	--	--	0.39	0.36	0.34	--	0.34
Distance towed (m)	907.5	703.8	--	--	722.3	666.7	629.7	--	629.7
Vessel speed (knots)	2	2	2	2	2	2	2	2	2
Direction (°True)	315	325	340	130	310	335	310		200
Bottom depth (m)	20	31	22.4	16.1	17	18	34	36	50
Bottom temperature (°C)	10.82	11.34	--	--	10.45	10.28	9.86	10.06	9.49
Tide	Flood	Flood	Flood	Low Slack	Low Slack	Low Slack	Flood	Ebb	Ebb
Tide height (feet)	9.6	12	12.8	1	0.8	0.9	1.9	12.8	10.5
Beaufort scale	3	3	1	5	5	3	3	3	3
Wind direction	SE	SE	SE	W	W	W	W	NW	NW
% cloud cover	40	40	80	100	100	100	100	50	50
Total catch (kg)	107.4	83.5	0	0	38	49.1	76.9	45.3	333.9
Number YOY lingcod	21	59	0	0	7	22	105	0	0
Swept area m^2	11797	9149	--	--	9390	8667	8186	--	8186
YOY density (number/km^2)	1780	6449	0	0	746	2538	12827	0	0
Usable tow	Y	Y	N	N	Y	Y	Y	N	Y

Appendix Table 3 (Cont.)

Tow number	82	83	84	85	86
Date	August 9	August 9	August 9	August 9	August 9
Site	TH	WC	WC	SB	SB
Region	East	East	East	East	East
Statistical Area	16	29	29	28	28
Depth Stratum	2	3	3	2	2
Start time (PST)	9:06	11:11	12:21	15:08	16:14
Duration (min)	8	10	9	10	10
Start position					
North Latitude	49° 30.18'	49° 25.96'	49° 25.56'	49° 17.44'	49° 17.37'
West Longitude	124° 2.13'	123° 41.9'	123° 41.1'	123° 13.54'	123° 12.2'
Finish position					
North Latitude	49° 29.9'	49° 25.96'	49° 25.73'	49° 17.49'	49° 17.42'
West Longitude	124° 2.19'	123° 42.42'	123° 41.5'	123° 13.05'	123° 12.76'
Distance towed (n.mi.)	0.29	0.33	0.30	0.37	0.36
Distance towed (m)	537.1	611.2	555.6	685.2	666.7
Vessel speed (knots)	2	2	2	2	2
Direction (°True)	185	265	310		275
Bottom depth (m)	33	37	33	31	23
Bottom temperature (°C)	9.91	10.02	9.99	11.16	11.21
Tide	Ebb	Low Slack	Low Slack	Flood	Flood
Tide height (feet)	7.6	2.2	2.2	4.9	9.1
Beaufort scale	3	4	4	3	3
Wind direction	NW	NW	NW	NW	NW
% cloud cover	50	50	50	70	70
Total catch (kg)	52.8	106.4	85.7	117.8	117.4
Number YOY lingcod	0	0	0	0	0
Swept area m^2	6982	7945	7223	8908	8667
YOY density (number/km^2)	0	0	0	0	0
Usable tow	Y	Y	Y	Y	Y

Appendix Table 4. Catch composition (kg) for major species or taxonomic groups captured during the 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. "Trace" refers to catches less than 0.1 kg. For a complete list of species captured, refer to Table 3.

	Catch (kg)															
Tow number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Fish species																
Lingcod	0.3	0.1	0.1	Trace	0.1	0.1	0.1	Trace	0.1	0.3	0.7	0.3	--	--	Trace	Trace
Copper rockfish	1.4	--	0.3	--	--	--	--	--	--	--	4.5	0.1	--	--	--	--
Quillback rockfish	0.1	--	--	--	--	--	--	--	--	--	0.4	0.1	--	--	--	--
Flatfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
English sole	0.1	11.4	3.6	0.2	4.6	0.4	20.5	6.1	35.7	47.3	3.8	0.9	12.1	30.3	18.5	16.7
Pacific sanddab	1.8	8.7	--	--	--	--	5.5	2.9	--	--	--	--	4.2	2.6	1.6	2.3
Southern rock sole	33.0	47.7	25.1	0.2	65.3	5.1	9.6	3.8	6.3	4.1	3.5	0.3	9.6	20.3	14.9	12.4
Starry flounder	--	9.6	70.4	0.8	42.0	34.6	0.2	--	4.0	24.9	0.3	--	--	1.7	2.7	3.7
Other flatfishes	--	3.8	0.8	0.6	4.2	0.9	5.5	1.2	13.3	10.7	2.2	0.5	4.9	4.7	5.7	4.2
Roundfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blackbelly Eelpout	--	0.2	--	--	0.2	--	2.0	0.3	0.6	0.5	1.3	Trace	Trace	Trace	Trace	Trace
Pacific cod	0.3	Trace	--	--	0.2	--	--	0.1	--	Trace	--	4.8	Trace	--	Trace	Trace
Pacific herring	--	--	--	--	--	--	0.2	0.1	0.4	0.5	--	--	0.6	0.2	Trace	0.7
Pacific tomcod	--	0.4	0.2	0.4	2.1	1.1	1.5	0.2	2.2	2.5	0.6	0.1	6.3	0.3	0.5	1.0
Plainfin midshipman	1.2	Trace	--	0.1	1.3	--	2.0	1.7	18.4	13.5	0.3	0.1	0.9	2.3	1.1	1.5
Pricklebacks	--	Trace	--	Trace	Trace	--	2.3	0.1	3.2	1.5	1.9	Trace	3.1	4.4	1.6	2.0
Sculpins	0.7	0.4	0.2	--	Trace	0.2	0.9	0.5	0.2	0.8	17.7	0.1	0.3	4.5	0.2	0.5
Shiner perch	--	0.4	0.2	--	Trace	--	2.2	1.1	2.0	2.0	5.1	0.9	2.3	0.9	0.7	1.0
Walleye pollock	--	--	1.5	1.2	2.1	3.4	0.2	0.9	0.8	0.8	--	--	0.2	0.2	Trace	--
Whitespotted greenling	--	0.1	--	--	0.2	--	0.3	Trace	--	0.2	0.1	0.1	0.3	0.2	0.1	Trace
Other fish	0.1	Trace	--	Trace	Trace	--	0.5	0.2	1.1	1.8	1.6	Trace	0.3	0.3	0.2	Trace
Cartilaginous fishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Skates	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Spiny dogfish	--	10.5	4.9	1.3	12.0	50.8	8.7	3.5	22.8	18.9	3.6	9.6	16.7	22.8	3.3	1.3
Spotted ratfish	--	--	11.9	8.0	0.5	34.6	--	--	--	--	--	--	--	--	--	--
Total Fishes	39.0	93.1	119.2	12.8	134.7	131.1	62.1	22.7	111.2	130.3	47.6	17.9	61.8	95.4	51.2	47.3
Invertebrate species	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dungeness crab	--	2.4	--	--	3.0	1.1	--	--	3.2	5.1	--	--	--	0.2	--	--
Giant plumose anemone	--	1.1	2.9	12.4	2.1	9.3	3.1	2.9	--	3.1	--	--	1.1	0.9	7.2	1.8
Pink short-spined star	--	--	--	--	--	--	6.1	4.5	0.9	--	--	--	--	--	1.2	--
Prawn or shrimp	--	--	--	Trace	0.4	0.4	--	--	--	--	48.1	1.5	--	--	--	--
Red rock crab	--	--	--	--	--	0.4	--	--	--	--	1.9	0.7	--	0.3	--	--
Sunflower starfish	--	--	--	--	--	--	1.9	1.2	--	--	--	0.1	--	1.2	--	--
Other invertebrates	5.1	Trace	--	Trace	Trace	--	0.3	0.1	--	0.5	Trace	Trace	--	--	0.2	Trace
Total invertebrates	5.1	3.5	2.9	12.4	5.5	11.2	11.4	8.7	4.1	8.6	50.0	2.3	1.1	2.6	8.6	1.8
Total catch	44.1	96.6	122.1	25.2	140.2	142.3	73.5	31.4	115.3	138.9	97.5	20.2	62.8	98.0	59.7	49.1

Appendix Table 4 (Cont.)

Tow number	Catch (kg) 17	18	19	20	22	23	24	25	27	28	29	30	31	32	33	34
Fish species																
Lingcod	0.1	0.1	0.5	0.2	Trace	0.4	Trace	0.3	0.3	0.2	0.2	0.2	0.6	0.4	0.4	0.2
Copper rockfish	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Quillback rockfish	--	--	--	0.4	--	--	--	--	--	--	--	--	--	--	--	Trace
Flatfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
English sole	35.9	30.8	22.9	--	0.2	1.4	4.3	8.5	0.5	0.8	3.5	--	4.1	8.8	8.2	2.1
Pacific sanddab	17.0	14.0	2.8	--	0.2	7.7	4.0	16.6	5.6	11.0	11.8	11.1	11.3	4.8	--	0.5
Southern rock sole	26.3	22.9	8.6	2.9	2.7	0.3	1.8	3.0	1.7	1.5	5.1	1.4	4.5	33.2	22.6	8.5
Starry flounder	--	0.6	0.3	--	--	--	5.8	--	--	--	--	--	--	3.8	5.3	4.4
Other flatfishes	8.9	6.7	5.0	--	--	0.2	1.6	0.4	0.4	0.4	0.4	0.4	3.4	2.2	0.5	1.1
Roundfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blackbelly Eelpout	Trace	--	Trace	--	--	--	--	--	--	--	--	--	--	--	--	--
Pacific cod	Trace	--	0.2	0.5	0.3	1.0	Trace	0.4	6.0	0.3	0.1	0.1	--	Trace	0.1	0.2
Pacific herring	0.3	0.6	0.2	--	Trace	--	0.1	--	--	Trace	--	0.1	--	Trace	--	--
Pacific tomcod	1.0	1.0	Trace	--	--	--	0.1	--	--	--	--	0.1	--	--	--	--
Plainfin midshipman	3.2	1.5	1.0	--	--	--	--	--	--	--	--	--	--	2.7	1.3	1.0
Pricklebacks	2.7	1.5	2.0	--	--	Trace	0.4	Trace	--	Trace	0.1	--	--	--	Trace	Trace
Sculpins	0.7	1.7	0.8	1.3	0.5	0.6	0.4	0.7	0.6	0.2	0.5	Trace	0.1	0.3	0.3	0.4
Shiner perch	3.2	2.1	3.0	--	--	Trace	--	--	0.1	--	--	--	--	0.7	0.2	Trace
Walleye pollock	Trace	0.4	Trace	5.7	0.7	Trace	--	--	--	--	--	--	--	--	--	--
Whitespotted greenling	Trace	0.1	0.3	Trace	Trace	0.2	0.4	0.1	0.4	Trace	0.1	0.1	0.2	0.1	0.5	0.6
Other fish	Trace	0.2	Trace	Trace	--	0.1	Trace	0.1	--	--	--	--	--	--	Trace	Trace
Cartilaginous fishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Skates	0.6	1.3	0.3	--	--	--	3.0	--	--	4.2	--	--	--	--	--	--
Spiny dogfish	6.8	43.1	7.3	62.6	434.3	10.2	17.5	11.5	134.2	13.4	4.2	2.8	2.2	8.3	2.1	1.9
Spotted ratfish	--	--	--	--	--	--	--	8.8	0.4	32.4	4.6	5.4	0.2	--	--	--
Total Fishes	106.6	128.6	55.1	73.6	438.9	22.1	39.4	50.4	150.2	64.4	30.6	21.7	26.6	65.2	41.5	20.9
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Invertebrate species	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dungeness crab	4.7	11.9	3.5	--	--	6.5	0.4	4.3	1.2	1.7	0.4	--	2.9	0.7	0.3	1.7
Giant plumose anemone	8.9	1.7	2.8	--	--	--	--	--	--	1.8	--	0.9	--	--	--	--
Pink short-spined star	--	2.6	--	--	--	--	--	--	--	--	--	--	--	--	--	0.6
Prawn or shrimp	0.7	--	Trace	30.8	3.5	8.8	--	--	--	--	--	Trace	Trace	--	--	Trace
Red rock crab	--	--	--	1.3	--	0.3	--	--	0.4	--	--	--	0.2	--	--	0.9
Sunflower starfish	--	--	2.8	2.1	--	--	--	2.0	0.3	0.3	--	--	--	--	1.8	0.6
Other invertebrates	--	--	0.2	1.3	Trace	0.1	--	0.1	23.4	--	0.2	Trace	--	--	--	--
Total invertebrates	14.3	16.2	9.2	35.4	3.5	15.7	0.4	6.4	25.3	3.8	0.6	0.9	3.1	0.7	2.1	3.8
Total catch	120.8	144.7	64.3	109.0	442.4	37.8	39.8	56.8	175.5	68.2	31.2	22.6	29.7	65.9	43.6	24.7

Appendix Table 4 (Cont.)

Tow number	Catch (kg) 35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Fish species																
Lingcod	0.1	0.3	0.4	0.4	0.2	0.6	0.4	0.2	1.0	0.6	--	--	0.2	0.4	0.3	0.1
Copper rockfish	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Quillback rockfish	--	--	--	--	--	--	--	--	0.1	--	--	Trace	--	--	--	--
Flatfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
English sole	1.9	0.2	30.9	46.2	20.5	58.8	82.5	8.4	49.0	17.9	14.6	15.2	56.1	16.2	19.9	41.6
Pacific sanddab	--	--	--	0.9	--	--	--	0.5	--	--	--	--	--	--	0.7	4.4
Southern rock sole	20.2	5.3	52.4	13.7	12.6	17.1	46.9	38.9	9.1	0.7	--	--	37.4	44.7	14.9	36.9
Starry flounder	--	--	--	--	--	--	--	25.9	5.3	--	--	--	--	--	--	--
Other flatfishes	3.1	4.4	3.1	3.3	0.7	2.4	5.9	6.2	7.8	9.5	45.5	80.4	5.9	1.0	2.6	4.8
Roundfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blackbelly Eelpout	--	--	--	0.4	--	--	0.3	0.7	3.4	5.1	7.4	5.7	--	--	--	--
Pacific cod	0.1	--	Trace	0.4	0.1	0.4	Trace	Trace	0.2	--	--	0.8	0.2	--	0.1	0.6
Pacific herring	--	--	--	--	--	--	--	0.2	0.2	0.9	0.6	--	--	--	--	--
Pacific tomcod	--	--	--	0.4	--	--	Trace	0.3	0.9	1.9	--	--	--	Trace	0.1	Trace
Plainfin midshipman	0.1	0.3	1.2	0.9	--	1.4	1.6	4.5	7.3	26.5	17.3	34.1	0.4	Trace	0.6	1.3
Pricklebacks	--	Trace	Trace	--	Trace	--	--	--	--	--	--	--	Trace	--	Trace	--
Sculpins	9.2	0.1	1.2	0.5	0.1	0.5	0.3	--	--	--	--	--	0.4	0.2	0.2	0.2
Shiner perch	--	--	0.2	0.5	0.8	Trace	0.3	0.5	0.9	Trace	--	--	3.1	0.6	0.4	0.9
Walleye pollock	--	--	--	--	--	--	--	0.2	3.0	2.1	Trace	0.4	--	--	Trace	Trace
Whitespotted greenling	0.5	0.4	0.2	0.1	0.1	0.2	Trace	--	--	--	--	--	0.5	0.8	0.2	Trace
Other fish	Trace	--	--	0.4	--	0.2	0.3	--	0.2	0.2	2.9	2.7	Trace	Trace	--	0.4
Cartilaginous fishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Skates	--	0.5	--	--	--	1.5	--	4.0	--	1.9	--	--	--	--	--	--
Spiny dogfish	77.0	2.8	49.1	7.9	13.2	1.4	15.1	9.0	21.7	28.3	18.5	11.9	115.2	124.7	37.5	--
Spotted ratfish	--	--	--	--	--	--	--	--	--	0.6	--	--	--	--	--	--
Total Fishes	112.2	14.3	138.7	75.9	48.4	84.5	153.4	99.4	110.0	96.3	106.8	151.1	219.5	188.7	77.5	91.1
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Invertebrate species	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dungeness crab	0.5	5.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Giant plumose anemone	--	--	--	0.9	--	--	--	--	--	1.4	--	--	--	0.5	0.8	--
Pink short-spined star	2.0	--	--	0.9	0.7	0.7	--	--	--	--	--	--	--	--	--	--
Prawn or shrimp	--	--	--	Trace	--	--	--	--	--	--	--	0.2	--	--	--	--
Red rock crab	0.4	--	--	1.8	--	--	--	0.5	--	--	--	--	--	1.0	0.5	0.6
Sunflower starfish	2.9	--	--	1.4	0.3	0.4	3.2	--	--	--	--	--	3.4	3.4	--	--
Other invertebrates	--	--	0.2	0.1	--	--	--	0.3	Trace	--	--	Trace	0.1	0.4	--	0.1
Total invertebrates	5.8	5.2	0.2	5.1	1.0	1.1	3.2	0.8	Trace	1.4	Trace	0.2	3.5	5.4	1.3	0.7
Total catch	118.0	19.5	138.9	81.0	49.3	85.5	156.6	100.2	110.0	97.7	106.8	151.3	223.0	194.1	78.8	91.7

Appendix Table 4 (Cont.)

Tow number	Catch (kg) 51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Fish species																
Lingcod	0.3	0.5	3.0	0.2	0.2	0.3	0.3	0.3	0.5	0.9	0.3	0.1	Trace	--	0.2	0.3
Copper rockfish	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Quillback rockfish	--	--	--	--	--	--	--	--	--	--	--	--	0.8	8.5	--	--
Flatfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
English sole	4.0	5.4	11.0	2.5	11.9	19.9	5.8	31.2	3.8	23.2	25.3	37.4	4.8	3.1	18.9	26.7
Pacific sanddab	--	--	--	--	--	1.9	1.3	--	--	--	--	--	--	--	--	--
Southern rock sole	--	0.1	0.6	14.6	14.5	141.4	4.8	4.8	15.8	1.8	43.1	66.8	0.8	--	27.0	11.5
Starry flounder	--	0.5	2.9	1.3	0.6	1.6	0.4	--	--	0.4	--	--	--	--	--	--
Other flatfishes	1.9	3.8	6.2	5.7	2.1	3.2	1.1	2.1	2.8	3.1	5.9	1.4	8.1	10.8	1.9	0.8
Roundfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blackbelly Eelpout	12.8	0.9	3.1	0.2	--	--	--	0.2	Trace	2.4	--	--	--	Trace	--	--
Pacific cod	--	--	--	--	Trace	0.3	5.3	--	27.3	--	2.4	0.2	--	--	0.2	--
Pacific herring	0.9	0.2	0.2	--	--	--	--	--	--	0.6	--	--	--	--	--	--
Pacific tomcod	6.6	0.4	2.5	2.3	0.5	--	--	0.7	--	3.1	--	Trace	--	--	--	--
Plainfin midshipman	0.7	1.3	12.7	4.8	0.5	0.5	1.6	3.1	0.3	2.9	0.4	--	0.5	0.6	0.2	0.2
Pricklebacks	0.9	0.1	1.7	Trace	Trace	--	--	--	--	1.7	--	--	--	Trace	--	--
Sculpins	0.2	0.3	0.3	0.1	Trace	0.3	Trace	--	0.3	0.2	0.2	0.6	0.1	--	0.7	0.7
Shiner perch	1.4	0.2	1.2	0.1	0.4	0.5	2.2	0.2	0.6	1.1	0.2	--	--	--	Trace	--
Walleye pollock	0.9	0.3	0.6	--	--	--	--	0.7	--	--	--	--	0.3	0.1	--	--
Whitespotted greenling	--	--	--	--	--	0.1	Trace	Trace	0.1	Trace	Trace	0.1	--	--	0.1	0.3
Other fish	0.2	0.1	--	--	--	--	6.7	Trace	--	0.6	--	Trace	0.1	1.0	--	Trace
Cartilaginous fishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Skates	0.3	--	--	0.9	--	--	0.5	--	--	--	--	--	--	0.5	--	1.5
Spiny dogfish	46.5	33.9	31.4	--	3.6	22.5	16.1	8.8	1.2	64.6	42.7	1.8	3.2	11.7	52.3	6.1
Spotted ratfish	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Fishes	77.5	48.0	77.3	32.7	34.3	192.6	46.1	52.0	52.8	106.5	120.5	108.5	18.7	36.3	101.4	47.9
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Invertebrate species	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dungeness crab	--	--	--	--	--	--	--	--	--	0.9	--	--	--	--	--	--
Giant plumose anemone	3.0	0.8	--	6.1	3.9	4.0	--	2.1	--	18.6	--	--	--	1.3	--	0.5
Pink short-spined star	1.6	0.9	1.0	--	--	--	--	--	2.3	--	--	--	--	--	1.3	6.1
Prawn or shrimp	Trace	Trace	--	--	Trace	--	--	--	--	Trace	--	--	--	Trace	--	--
Red rock crab	--	0.4	--	0.1	--	0.8	--	--	0.3	--	1.3	1.2	--	--	--	--
Sunflower starfish	--	3.2	1.3	--	--	2.7	0.4	--	--	--	--	--	--	--	--	0.7
Other invertebrates	0.2	0.5	Trace	--	--	0.4	Trace	1.8	0.4	0.4	--	--	0.1	0.3	0.3	0.5
Total invertebrates	4.8	5.8	2.3	6.2	3.9	7.9	0.4	3.9	3.0	19.9	1.3	1.2	0.1	1.6	1.6	7.8
Total catch	82.3	53.8	79.6	38.9	38.2	200.5	46.5	55.9	55.8	126.4	121.8	109.7	18.8	37.9	103.0	55.7

Appendix Table 4 (Cont.)

Tow number	Catch (kg) 67	68	69	70	71	72	73	74	77	78	79	81	82	83	84	85	86
Fish species																	
Lingcod	0.3	0.7	2.5	1.8	0.2	Trace	0.5	1.7	0.2	0.7	2.8	--	--	--	--	--	--
Copper rockfish	--	--	0.9	--	1.9	--	--	--	1.6	--	--	--	--	1.1	--	--	--
Quillback rockfish	--	Trace	--	--	--	--	--	--	--	--	--	--	0.5	--	0.1	--	--
Flatfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
English sole	2.7	15.4	17.7	15.1	6.7	2.8	21.4	30.1	11.7	22.5	38.9	15.8	1.3	35.6	17.5	7.7	22.6
Pacific sanddab	--	--	--	--	--	--	0.9	--	--	--	1.1	62.7	6.0	8.3	4.5	4.4	0.7
Southern rock sole	9.1	10.8	26.4	18.3	16.1	8.1	41.0	26.6	17.2	9.9	13.3	70.8	19.7	31.3	41.1	2.0	8.2
Starry flounder	--	--	--	--	--	--	--	--	--	--	--	--	--	0.8	--	0.3	--
Other flatfishes	0.1	0.9	2.7	1.7	1.0	1.0	4.5	4.4	1.2	0.8	3.7	63.9	2.6	1.4	3.3	4.4	2.2
Roundfishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blackbelly Eelpout	--	--	--	--	--	--	--	--	--	--	--	2.9	--	--	--	68.0	22.8
Pacific cod	0.2	Trace	1.9	0.1	Trace	0.1	--	0.3	0.1	--	0.3	--	--	--	--	--	--
Pacific herring	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.3	0.7
Pacific tomcod	--	--	--	--	--	--	--	--	--	--	Trace	--	--	--	0.2	0.7	Trace
Plainfin midshipman	0.1	0.1	0.2	0.8	0.1	0.1	0.5	2.1	0.1	--	1.7	34.2	1.8	0.6	0.6	0.7	--
Pricklebacks	--	--	--	--	--	--	--	--	--	--	--	Trace	--	0.2	0.4	2.7	5.3
Sculpins	1.7	0.2	1.0	0.4	0.1	0.1	5.4	4.3	Trace	0.1	3.7	0.3	0.8	1.0	1.2	0.3	0.7
Shiner perch	--	--	Trace	--	--	--	--	0.4	--	0.1	0.3	41.4	0.5	10.8	3.9	3.4	4.0
Walleye pollock	--	--	--	Trace	Trace	Trace	--	--	Trace	--	--	0.3	8.2	--	--	Trace	--
Whitespotted greenling	Trace	0.2	0.6	0.4	0.1	0.1	0.7	0.3	0.2	0.6	0.2	--	--	0.4	0.3	--	0.9
Other fish	Trace	Trace	--	0.1	Trace	--	--	0.1	--	--	0.8	Trace	--	--	Trace	3.4	0.9
Cartilaginous fishes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Skates	--	--	--	--	--	9.7	24.0	0.4	--	8.1	--	--	2.0	--	0.3	--	--
Spiny dogfish	17.0	30.1	10.0	--	--	5.1	4.1	9.0	5.7	--	7.4	41.0	8.8	--	6.2	3.7	31.4
Spotted ratfish	--	0.8	6.7	0.6	--	1.0	--	1.5	--	6.0	--	--	--	--	--	--	--
Total Fishes	31.2	59.2	70.5	39.4	26.2	28.1	102.9	81.1	38.0	48.8	74.0	333.3	52.2	91.3	79.6	101.9	100.3
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Invertebrate species	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dungeness crab	--	--	--	--	--	--	--	--	--	--	--	0.6	--	6.9	--	9.1	7.5
Giant plumose anemone	0.5	--	--	--	--	--	--	--	--	--	--	--	0.6	8.2	6.1	6.8	9.5
Pink short-spined star	--	--	--	--	--	--	--	--	--	--	1.1	--	--	--	--	--	--
Prawn or shrimp	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trace	--
Red rock crab	--	--	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sunflower starfish	--	--	--	--	--	--	4.2	2.0	--	0.2	1.1	--	--	--	--	--	--
Other invertebrates	0.4	Trace	Trace	1.5	0.6	0.2	0.3	0.4	--	0.1	0.8	--	Trace	--	--	--	--
Total invertebrates	0.9	Trace	0.2	1.5	0.6	0.2	4.5	2.4	Trace	0.3	3.0	0.6	0.6	15.1	6.1	15.9	17.1
Total catch	32.1	59.2	70.7	40.9	26.8	28.3	107.4	83.5	38.0	49.1	76.9	333.9	52.8	106.4	85.7	117.8	117.4

Appendix Table 5. Length (mm), weight (g), and sex (1 = male; 2 = female; 3 = unknown) of copper rockfish (*Sebastes caurinus*), quillback rockfish (*S. maliger*), and greenstriped rockfish (*S. emphaeus*) captured during the 2006 bottom trawl survey for young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. For site names and locations, refer to Table 1. For definitions of depth strata (DS), refer to Table 2.

Copper Rockfish							Quillback Rockfish							Greenstriped Rockfish						
DS	Tow	Site	Fish ID	Length (mm)	Weight (g)	Sex	DS	Tow	Site	Fish ID	Length (mm)	Weight (g)	Sex	DS	Tow	Site	Fish ID	Length (mm)	Weight (g)	Sex
3	1	LZ	1	432	1032	1	3	1	LZ	21	99	15	3	5	46	QU	7	243	170	2
3	1	LZ	7	168	73	2	3	1	LZ	22	117	26	1	5	46	QU	8	157	52	2
2	3	NS	8	171	86	2	3	1	LZ	23	122	29	3	5	46	QU	9	162	49	3
2	3	NS	9	127	194	2	3	11	PY	24	127	29	3	5	46	QU	10	230	152	2
3	11	PY	10	200	141	1	3	11	PY	25	139	52	2	5	46	QU	11	170	63	2
3	11	PY	11	168	76	2	3	11	PY	26	139	43	3	5	46	QU	12	165	50	1
3	11	PY	12	188	102	1	3	11	PY	27	147	51	3	5	46	QU	13	193	96	1
3	11	PY	13	269	362	2	3	11	PY	28	101	17	3	5	46	QU	14	168	64	2
3	11	PY	14	172	88	1	3	11	PY	29	174	92	2	5	46	QU	15	172	60	1
3	11	PY	15	169	85	2	3	11	PY	30	144	49	2	5	64	CL	1	235	220	2
3	11	PY	16	272	342	2	3	11	PY	31	142	50	1	5	64	CL	2	208	115	2
3	11	PY	17	242	237	2	3	11	PY	32	114	26	2	5	64	CL	3	222	138	1
3	11	PY	18	272	381	2	3	11	PY	33	160	68	1	5	64	CL	4	205	101	3
3	11	PY	19	159	65	2	2	12	PY	34	132	37	1	5	64	CL	5	228	160	2
3	11	PY	20	116	64	1	2	34	FC	1	94	12	2	5	64	CL	6	198	93	3
3	11	PY	21	330	656	2	2	34	FC	2	90	10	3							
3	11	PY	22	266	327	2	4	43	QU	3	144	44	1							
3	11	PY	23	180	108	1	4	43	QU	4	153	50	2							
3	11	PY	24	301	416	1	4	43	QU	5	145	48	2							
3	11	PY	25	155	235	3	5	46	QU	6	165	72	2							
3	11	PY	26	215	170	2	4	63	CL	18	371	780	2							
3	11	PY	27	202	137	1	5	64	CL	7	335	780	1							
3	11	PY	28	168	80	1	5	64	CL	8	390	1040	2							
3	11	PY	29	191	110	2	5	64	CL	9	389	1020	2							
3	11	PY	30	171	75	2	5	64	CL	10	348	700	1							
3	11	PY	31	163	69	2	5	64	CL	11	315	480	1							
3	11	PY	32	195	112	1	5	64	CL	12	331	600	2							
2	12	PY	33	163	76	1	5	64	CL	13	372	920	1							
2	12	PY	34	167	76	2	5	64	CL	14	360	780	1							
2	69	OB	2	338	720	2	5	64	CL	15	353	760	1							
1	71	OB	3	480	2020	1	5	64	CL	16	340	640	2							
1	77	OB	4	341	594	2	5	64	CL	17	305	520	1							
1	77	OB	5	388	982	1	2	68	KC	19	105	18	2							
3	83	WC	6	382	1060	1	3	84	WC	35	122	28	2							

Appendix Table 6. Length frequency for spiny dogfish (*Squalus acanthias*) captured in the northern and southern regions during the 2006 bottom trawl survey for young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. For definitions of depth strata (DS), refer to Table 2.

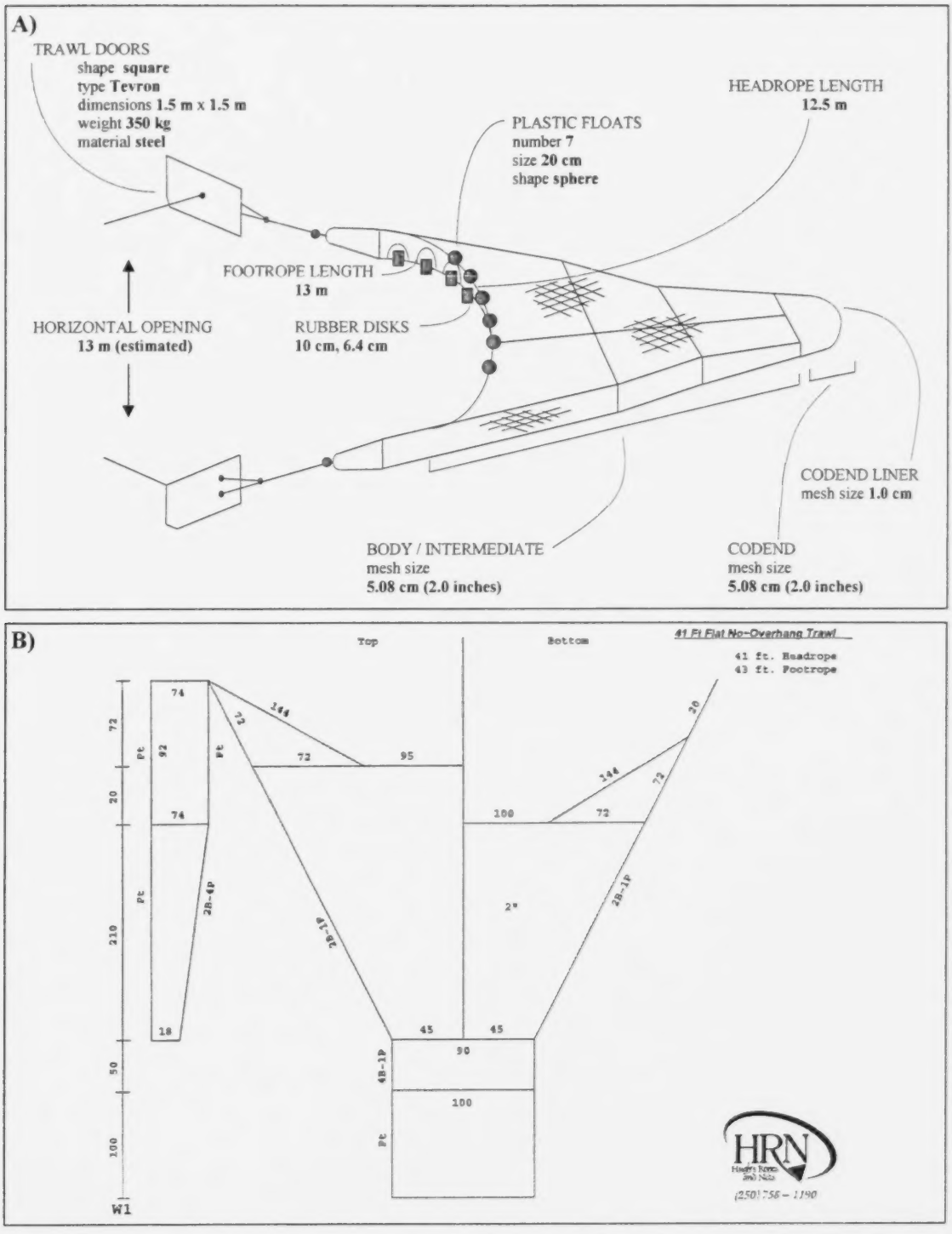
	South (DS3)			North (DS1)		
Length (cm)	Male	Female	Total	Male	Female	Total
50	1	--	1	--	--	--
51	0	--	0	--	--	--
52	1	--	1	--	--	--
53	0	2	2	--	--	--
54	0	3	3	--	--	--
55	0	0	0	--	--	--
56	1	1	2	--	--	--
57	0	1	1	--	--	--
58	2	0	2	--	--	--
59	2	3	5	--	--	--
60	0	2	2	--	--	--
61	3	4	7	--	--	--
62	3	2	5	1	--	1
63	5	0	5	0	--	0
64	1	1	2	0	--	0
65	2	2	4	0	--	0
66	0	5	5	0	--	0
67	0	2	2	0	--	0
68	1	2	3	0	1	1
69	0	4	4	0	0	0
70	1	1	2	1	2	3
71	0	2	2	1	0	1
72	1	1	2	2	3	5
73	--	1	1	2	1	3
74	--	1	1	2	2	4
75	--	1	1	2	1	3
76	--	1	1	5	3	8
77	--	--	0	4	3	7
78	--	--	0	4	4	8
79	--	--	0	2	5	7
80	--	--	0	3	3	6
81	--	--	0	2	1	3
82	--	--	0	1	4	5
83	--	--	0	1	4	5
84	--	--	0	0	5	5
85	--	--	0	2	5	7
86	--	--	0	0	4	4
87	--	--	0	1	2	3
88	--	--	0	1	5	6
89	--	--	0	1	4	5
90	--	--	0	2	0	2
91	--	--	0	3	2	5
92	--	--	0	2	2	4
93	--	--	0	1	1	2
94	--	--	0	0	1	1
95	--	--	0	1	0	1
96	--	--	0	1	1	2
97	--	--	0	3	1	4
98	--	--	0	2	--	2
99	--	--	0	1	--	1
Total	24	42	66	54	70	124

Appendix Table 7. Length frequency for Pacific cod (*Gadus macrocephalus*) captured in the northern, southern, and southwestern regions in depth stratum 2 during the 2006 bottom trawl survey for young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. For definitions of depth strata, refer to Table 2.

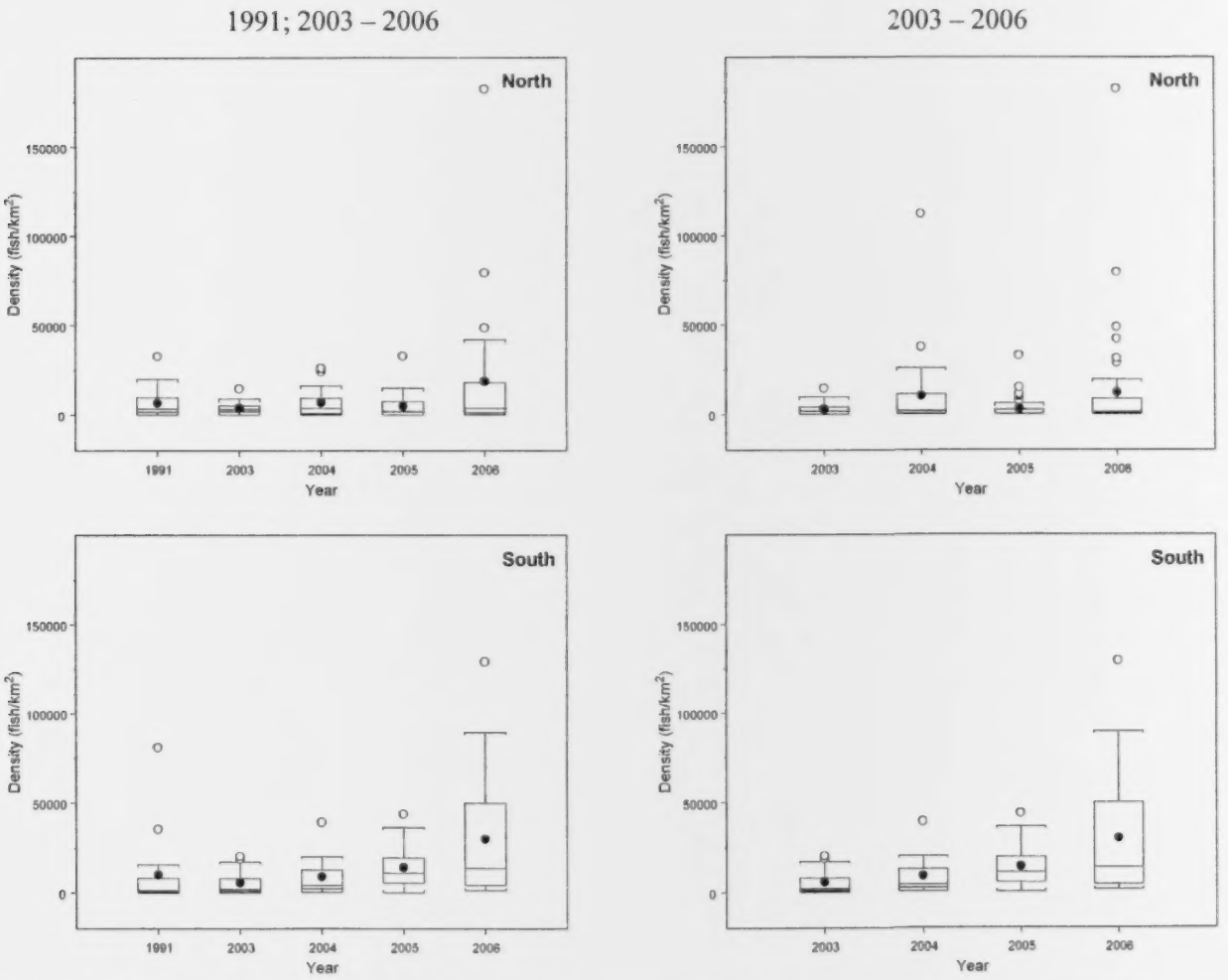
Length (cm)	North	South	Southwest
8	--	--	1
9	--	--	2
10	--	--	18
11	11	3	40
12	23	23	69
13	34	33	48
14	20	43	15
15	18	16	2
16	12	--	--
17	6	--	--
18	2	--	--
Total	126	118	195

Appendix Table 8. Length frequency for English sole, rock sole, and Pacific sanddab by region and depth stratum (DS) during the 2006 bottom trawl survey for young-of-the-year lingcod in the Strait of Georgia, *CCGS Neocaligus*, July 28 – August 9, 2006. For definitions of depth strata, refer to Table 2.

Length (cm)	English Sole					Rock sole				Pacific Sanddab
	North (DS2)	South (DS1)	South (DS2)	Southwest (DS2)	East (DS3)	North (DS2)	South (DS2)	Southwest (DS2)	East (DS3)	South (DS1)
7	--	3	--	--	--	--	--	--	--	--
8	--	6	--	--	--	1	--	--	3	--
9	--	6	--	--	--	3	--	1	6	--
10	3	10	--	7	--	15	--	7	42	3
11	1	7	--	6	--	9	1	7	31	7
12	0	12	--	0	--	5	0	2	23	5
13	3	17	--	19	1	3	0	2	19	4
14	10	20	--	17	12	6	1	7	12	5
15	18	30	1	16	22	9	0	7	15	1
16	15	18	3	11	23	9	0	7	15	2
17	21	9	8	11	15	8	0	6	12	11
18	21	3	6	5	17	6	2	7	9	10
19	23	0	7	4	12	11	1	1	6	2
20	13	3	5	5	15	7	0	9	8	5
21	8	0	6	3	14	10	1	6	7	6
22	11	2	6	3	13	13	1	6	6	2
23	6	2	4	1	7	10	3	6	4	4
24	5	--	4	1	8	5	2	5	1	2
25	9	--	4	1	0	4	0	3	2	1
26	4	--	5	1	4	7	1	2	1	1
27	2	--	0	0	--	6	1	2	3	1
28	6	--	1	1	--	8	2	3	5	3
29	8	--	0	1	--	4	3	1	3	2
30	4	--	1	--	--	5	6	5	5	3
31	5	--	3	--	--	3	3	2	2	2
32	0	--	1	--	--	6	3	0	0	--
33	1	--	0	--	--	2	3	0	0	--
34	2	--	1	--	--	1	0	1	0	--
35	2	--	1	--	--	1	0	0	0	--
36	3	--	--	--	--	--	1	0	2	--
37	1	--	--	--	--	--	0	1	--	--
38	1	--	--	--	--	--	0	--	--	--
39	0	--	--	--	--	--	1	--	--	--
40	0	--	--	--	--	--	--	--	--	--
41	1	--	--	--	--	--	--	--	--	--
42	1	--	--	--	--	--	--	--	--	--
Total	208	148	67	113	163	177	36	106	242	82



Appendix Figure 1. Bottom trawl net (Marinovich flat regular Gulf Coast style) fished by the *CCGS Neocaligus* during the 2006 bottom trawl survey of young-of-the-year lingcod in the Strait of Georgia, July 28 – August 9, 2006. A) Net dimensions and characteristics. B) Schematic diagram (provided by Hugh's Rope and Nets, 2230 McGarrigle Road, Nanaimo, BC).



Appendix Figure 2. Box plots representing the density (fish/km^2) of gadid species (cod: Pacific cod, *Gadus macrocephalus*, tomcod, *Microgadus proximus*, and pollock, *Theragra chalcogramma*) by survey year for the northern and southern regions of the Strait of Georgia for bottom trawl surveys at sites visited every year in the 1991; 2003 – 2006 time series and in the 2003 – 2006 time series. The horizontal line in the centre of each box represents the median, while box edges depict the 1st and 3rd quartiles. The range of the data are represented by the whiskers, while outliers are represented by ○. The mean density is represented by •.